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Visor Use Among U.S. Army Rotary-Wing Aviators

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Visors are optical devices that provide a level of comfort and protection from dust, wind, sun glare and particle fragments and, in the case of a crash, from tree branches, rocks, debris and aircraft structural parts. This report presents the results of a survey whose objective was to document visor usage, and identify problems associated with optical quality, and maintenance in Army rotary-wing aviation. The survey was distributed to U.S. Army aviators and crewmen at Fort Hood, Texas; Fort Rucker, Alabama; Fort Campbell, Kentucky; and Fort Bragg, North Carolina. The survey identified that guidelines for visor use need to be established. Minor problems with haze, distortion, luminous transmittance, and prismatic deviation were also identified. Other problems include mechanical difficulties; e.g., visors sticking and coming off track, inadequate custom trimming for IHADSS visors, and ANVIS incompatibility. Data support that dual-visor design results in higher percentage of visor use.

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Introduction

Visors are look-through optical media, usually fabricated from CR-39 plastic or polycarbonate materials. Polycarbonate is the preferred material due to its enhanced impact protection. The purpose of visors is to provide protection from dust, wind, sun glare, and particle fragments and, in the case of a crash, from tree branches, rocks, debris, and aircraft structural parts. It should be noted that contrary to verbiage in many documents, visors are not designed to provide "ballistic" protection. However, they are expected to provide impact resistance. (To clarify this statement, visors are designed to provide limited protection against shell fragments, but not from direct hits of shells themselves.) In more succinct terms, visors can prevent painful, serious injuries to the head and face (Reynolds et al, 1997).

In U.S. Army aviation, visors are classified as Class I or II (Figure 1). These classes are defined in military specification MIL-V-43511C, "Visors, flyer's helmet, polycarbonate." Class I visors are clear, having a photopic (daytime) luminous transmittance of 85% or greater. Class II visors are neutrally tinted, having a photopic luminous transmittance between 12-18%. An exception to the Class II luminous transmittance requirement is granted to the tinted visor used in the Integrated Helmet Unit (IHU) of the Integrated Helmet and Display Sighting System (IHADSS) in the AH-64 Apache. The IHADSS Class II visor has a photopic luminous transmittance between 8-12%. This lower range of transmittance is needed to improve visibility of real-time imagery provided on the IHADSS helmet-mounted display (HMD). Regardless, all visors generally are held to the optical specifications for refractive power, prismatic deviation, distortion, haze, impact resistance, etc., cited in MIL-V-43511C. The test for compliance of impact resistance uses a caliber - .22 T37 fragment simulating projectile at an impact velocity between 550 and 560 feet per second. The test is conducted in accordance with MIL-STD-662.

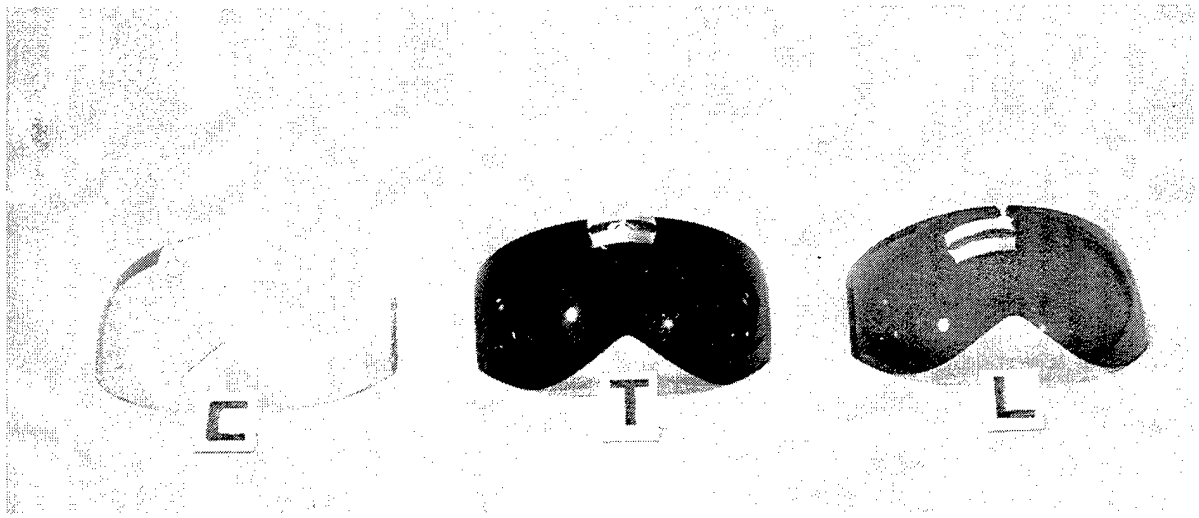

Figure 1. Class I (clear), class II (tinted), and laser protective visors.

Another deviation from the visor classes above is special purpose visors which are designed to provide protection from lasers (Figure 1). The luminous transmittance of laser visors can vary greatly depending on the wavelengths or combination of wavelengths for which the protection is being provided. Over the years a number of types of laser visors have been evaluated for use (Rash and Martin, 1990; Bohling and Rash, 1991; Rash, Bohling, and Martin, 1991). However, except for a brief fielding period during the Desert Shield/Desert Storm war, the authors are not aware of any official designation of laser visors. But, in spite of a lack of formal fielding, a number of various types of laser visors are in use among Army aviation units.

Most, if not all, currently fielded visors are manufactured of polycarbonate. As cited previously, this material is used due to its improved impact protection. However, this protection and the overall quality of vision through the visor can be maintained only by proper care of the visor. If any signs of cracks, blurring, dulling, or crazing of the visor occur, it should be replaced. When cleaning is necessary, the visor should be washed with soapy water or a mild glass or plastic cleaner. A soft cloth should be used to prevent scratching. Special precautions should be taken to reduce contact with organic solvents which adversely affect the polycarbonate material (USAAAVS, 1972). Laser visors which use dyes mixed with the polycarbonate material to provide protection against one or more laser wavelengths can experience a degradation in this protection over prolonged exposure to ultraviolet radiation which is present in normal sunlight. Therefore, these visors should be protected from direct sunlight when not in use. Laser visors which provide protection by coating layers can be scratched easily.

Visors are fielded on all current aviator helmets. Issues associated with visors include how frequently they are used, when they are used, whether or not they function as designed, and what problems, mechanical or optical, are present. Aviator acceptance is important in ensuring the use of any device or system. Therefore, user satisfaction with current visor designs is of interest to helmet program managers.

To address these and other issues, a survey questionnaire on visor use was developed and distributed to U.S. Army aviators and crewmen at Fort Hood, Texas; Fort Rucker, Alabama; Fort Campbell, Kentucky; and Fort Bragg, North Carolina. A total of 255 questionnaires were returned. This report presents the data from this survey and provides a summary of visor use, acceptance, and problems.

Aviator helmets

In Army aviation, the visors are mounted within the visor housing on the flight helmet. The use of protective flight helmets was a first step in reducing head and facial injuries. Recorded in historical aviation documents and photographs, early aviators wore helmets made of leather and fabric. Their purpose for the most part was for protection from the elements; e.g, wind, rain, and the occasional insect and bird. Some aviators recognized the need for impact protection and wore industrial-style, hard-shelled helmets. An accident investigated in 1913 involving two U.S. Army Signal Corps pilots revealed that one of the men escaped serious injury because of the presence of his helmet (U.S. Army Board for Aviation Accident Research, 1962). However, the

Army did not adopt an aviator helmet until October 1959 with the introduction of the Aviator Protective Helmet No.-5 (APH-5). Today, there are four helmets currently in use by Army aviators- the Sound Protective Helmet (SPH-4) (Figure 2), the improved Sound Protective Helmet (SPH-4B) (Figure 3), the AH-64 Integrated Helmet and Display Sighting System (IHADSS) Integrated Helmet Unit (Figure 4), and the Head Gear Unit-/P (HGU-56/P) (Figure 5).

The APH-5 was based on a previous U.S. Navy design. It was molded from glass fabric and polyester resin, providing force distribution and penetration resistance. Helmet fit was achieved by means of pads used to contour the helmet to the head. While providing previously available impact protection, the APH-5 provided minimal hearing protection from aircraft noise (McEntire, 1997). The APH-5 incorporated a single visor.

The SPH-4 was introduced in 1969. At that time, it provided state-of-the-art acoustic and crash protection to aircrew members. The single visor configuration was a tradeoff between weight, impact protection, electronics, etc. A maximum weight, a critical factor in fatigue and crash dynamics, was set at 3.5 pounds. The standard SPH-4 underwent two minor changes: in 1974, a thicker foam liner was used and, in 1982, a thinner shell was adopted. Post-fielding dual-visor adaptor kits were evaluated but rejected due to undue neck muscle fatigue which would be incurred. The recommended visor use at that time was to wear standard issue sunglasses under the clear visor (USAAAVS, 1975).

The SPH-4B, a vastly improved version of the SPH-4, was fielded initially in July 1991. Its outward appearance is similar to that of the SPH-4. However, its performance is quite different. It has an improved Styrofoam™ liner, new energy absorbing earcups, an improved retention system, a lighter shell of Kevlar™, an Aviator's Night Vision Imaging System (ANVIS) mount, a Thermoplastic Liner™ (TPL)™, and a dual visor assembly (Carter, 1992). The dual visor design allows the use of either or both visors. The SPH-4B is issued with a Class I (clear) and Class II (tinted) polycarbonate visor. The clear visor is mounted on the outside track, with the tinted visor being the closer to the face.

The IHADSS helmet was developed specifically and exclusively for use in the AH-64 Apache attack helicopter. First fielded in the early 1980's, the IHADSS helmet incorporates an HMD display with head motion sensing capability. The IHADSS helmet provides impact and acoustical protection at least equivalent to that of the SPH-4 (which was, at the time of the IHADSS fielding, the current aviator helmet). Two visors (Classes I and II) are provided in separate visor housings. [To allow use of ANVIS, the standard IHADSS visor assembly is replaced with an SPH-4 ANVIS mount and visor.] While only allowing use of a single polycarbonate visor at a time, the two visor housings can be rapidly changed out using simple thumbscrews. [Note: Due to the uniqueness of the IHADSS, the visors must be custom trimmed to be able to be lowered over the HMD optics (helmet display unit - HDU).] The IHADSS helmet was a crashworthiness challenge because now the helmet was being used as a platform for an HMD but still had to provide the visual, acoustical, and impact protection expected from a standard helmet.

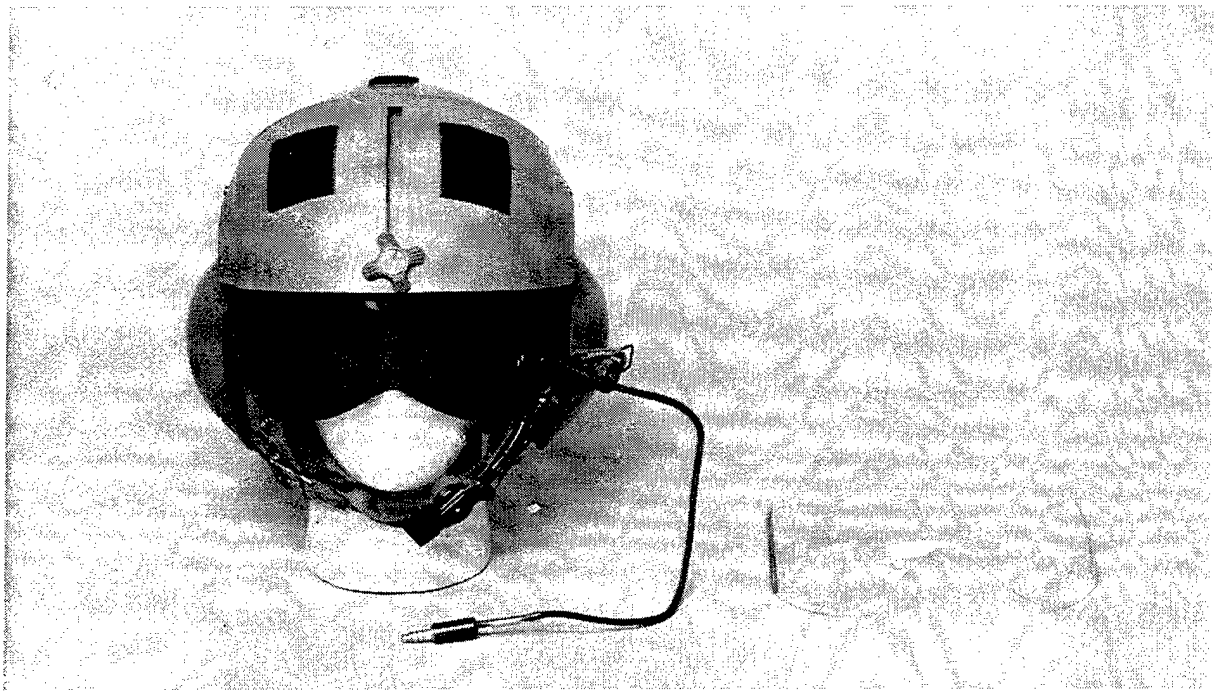

Figure 2. The SPH-4 helmet and visors.

Figure 3. The SPH-4B helmet and visors.

Figure 4. The HGU-56/P helmet and visors.

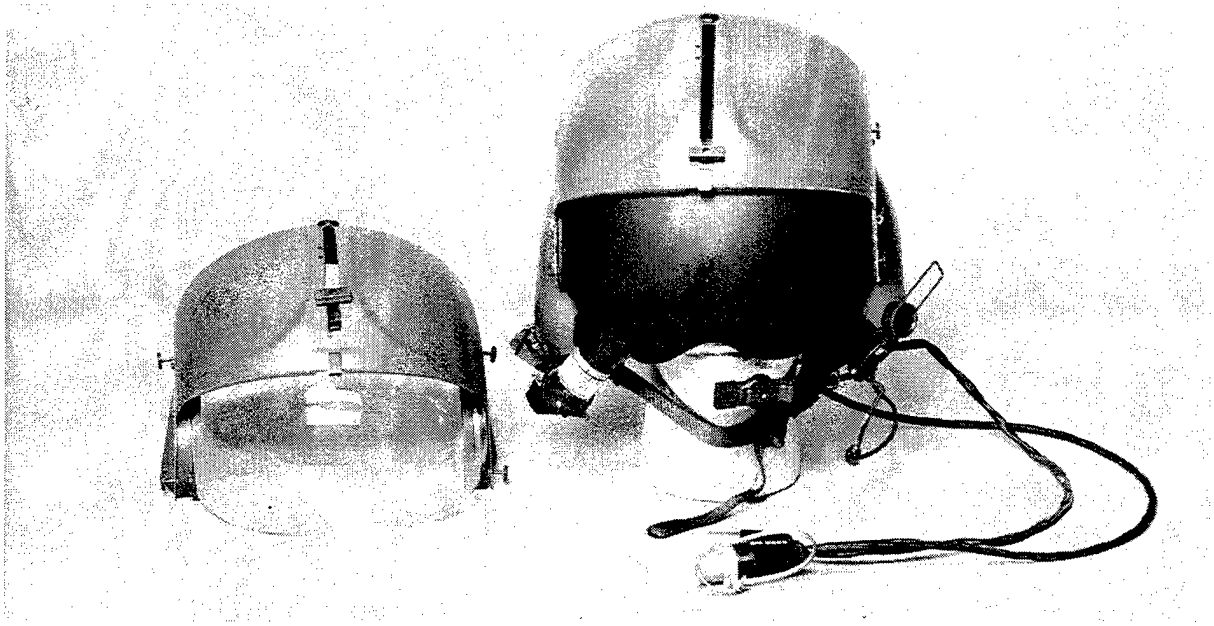

Figure 5. The IHADSS helmet and visors.

The most recently fielded aviator helmet is the HGU-56/P. Besides providing improved impact protection over the SPH-4B, the HGU-56/P moves toward an Army goal of having a single common aviation helmet. The final version was fielded in 1995. The HGU-56/P (2.6 pounds) has a reduced weight over the SPH-4B (2.8 pounds). It retains the TPL™ liner and crushable earcups, but the Kevlar™ cloth shell used in the SPH-4B was replaced with a nylon and graphite cloth shell. The HGU-56/P uses polycarbonate visors, a clear and tinted, mounted in a dual visor assembly. The clear visor is mounted closest to the face, reversed from the mounting in the SPH-4B. This change was initiated in hopes that future ANVIS designs would allow visor usage without degrading user performance.

There is one additional helmet in Army aviation, which is designed to be worn exclusively by ground crewmen. First fielded in October 1989, it is used to provide protection during refueling operations (Rudi, 1989). Known as Helmet Assembly Rearming Refueling Personnel (HARRP), it is an adaptation of a Navy flight deck helmet. Two versions were issued: the HGU-25/P, which is communications equipped, and the HGU-25/P with aural protection. These helmets do not incorporate visors but rely on the use of sun, wind, and dust goggles.

Visor use

There is apparently no Army-wide policy on the wearing of visors. However, many units have policies or guidelines for when visors must (or should) be worn. Aviators appear not to use their visors for a variety of reasons. These reasons deal primarily with quality of vision when viewing through multiple optical surfaces; e.g., windscreens, blastshields, and sunglasses. Informal surveys imply that approximately 30% of aviators wear sunglasses instead of a tinted visor. Standard aviator sunglasses (N-15) consist of neutral filters which transmit approximately 15% of the light incident on them. They are not polarizing sunglasses. In addition, they transmit all colors equally, so all warning and caution lights are discriminable. However, the sunglasses are incapable of providing the level of impact protection against head and facial injury provided by polycarbonate visors.

In the description of flight helmets above, it was stated that the SPH-4 had a single visor assembly. When wearing this helmet, the aviator has to choose between the clear and tinted visor, as switching out assemblies is not practical during flight. The AH-64 IHADSS helmet also uses a single visor assembly. However, the IHADSS visor assemblies have a thumbscrew method of assembly mounting and removal which greatly simplifies the switching of visors. However, the alternate assembly is rarely carried in the aircraft. Both the SPH-4B and the HGU-56/P helmets have dual visor assemblies allowing the use of both clear and tinted visors without having to switch. This type of configuration is possible due to weight savings resulting from the use of lighter weight Kevlar™ and nylon/graphite helmet shells. However, typically, during night operation using image intensification devices such as ANVIS, visors can not be lowered without moving the ANVIS out beyond its optimum position.

Survey questionnaire

Visor issues were investigated though the use of a written questionnaire. The questionnaire gave the users the opportunity to report their experiences with currently fielded visors, to raise issues concerning problems encountered, and to provide suggestions in how to improve the utility of visors. The same questionnaire was distributed to all aircrewmen (see Appendix A). The questionnaire was divided into five sections: demographics, usage, optical quality, maintenance, and a section for IHADSS visors only.

Respondents were requested to base their responses on the visors (and the associated helmet) they had worn the most during the past year.

Questionnaires were distributed to U.S. Army aviators and crew at Fort Hood, Texas; Fort Rucker, Alabama; Fort Campbell, Kentucky; and Fort Bragg, North Carolina. A total of 255 questionnaires were returned.

Questionnaire data and findings

Questionnaire data are provided in Appendix B.

Demographics

The 255 respondents are overwhelmingly male (96.9% vs 3.1%) and primarily occupy the role of pilot/copilot; only 7.8% are flight crew. These data represent experience accumulated over approximately 511,302 flight-hours (mean flight-hours per respondent is 2,005). This experience encompasses eight Army rotary-wing aircraft (AH-1, AH-64, CH-47, OH-58C&D, UH-1, UH-60, and TH-67) and four flight helmets (SPH-4, SPH-4B, HGU-56/P, and IHADSS). The demographics of the questionnaire respondents are summarized in Table 1.

Table 1.
Demographics.

Sex (n=255)	Male 96.9%	Female 3.1%		
Current status	Pilot 85.9%	Copilot/gunner 5.9%	Flight crew 7.8%	
Flight hours (511,302)	IHADSS 59,836	HGU-56/P 152,870	SPH-4B 242,396	SPH-4 200
Use of corrective lens	Glasses 19.2%	Contacts 3.5%	None 77.3%	

Usage

Survey questions on usage included which visor types were available and installed on the respective helmets, when and to what extent visors are worn deployed, what mechanical problems have been encountered, and overall satisfaction level of current visor assembly. Respondents also were asked to express a preference for single or dual visor assemblies.

Most respondents indicated that both clear and tinted visors were available. Respondents wearing IHADSS and SPH-4 helmets reported less availability of the clear visor (76.5% and 81.3%). Both of these helmets have single visor assemblies. This means that only one visor can be installed at any given time. It is likely that the clear visors in these cases have been misplaced or lost. Although laser visors are not fielded at this time, a number of prototype visors have been issued over the years for evaluation purposes. This would explain the percentage of respondents who reported laser visors as available. When the respondents were asked which visors were actually currently installed on their helmets, the wearers of SPH-4B and HGU-56/P dual visor helmets, as expected, reported both clear and tinted (a few laser visors are installed). Wearers of SPH-4 and IHADSS single visor helmets showed a preference for having a tinted visor installed (a ratio of greater than 3:1 over clear).

Based on all respondents, during day flights, a tinted visor is used 61% of the time and no visor is used 25% of the time. For night flights, no visor is used 76% of the time. Most of this percentage is due to the fact that a visor can not be deployed while using ANVIS. A clear visor is used only 9% of the time during day flights and 11% during night flights. When visor use is looked at by helmet type, visors are deployed for a greater percentage of day flight time for the dual visor helmets than for the single visor helmets. Night time use is about the same for all helmets except for the SPH-4, where a visor is used only 4% of the time. When day and night use is combined, the trend is maintained; the dual visor helmet wearers report the greatest overall use of visors, SPH-4B (40%) and HGU-56/P (46%), as compared to single visor helmet wearers, IHADSS (37%) and SPH-4 (28%). A universal complaint was that visors can not be deployed when wearing ANVIS.

Mechanical difficulties with visors assemblies were reported as wide spread (73.7% reported problems). Based on total responses, the three most reported problems were "sticks in tracks" (48.6%), "difficult to lock/unlock" (29.0%), and "comes off tracks" (22.0%). Additional problems included knobs coming loose and screws loosening. This ranking holds true when looking at visors on individual helmets. The predominant problem reported for each helmet was "sticks in tracks," with the highest percentages being for IHADSS (55.9%) and HGU-56/P (51.9%). The helmet visor assembly with the highest percentage of reported problems is IHADSS (82.4%).

Visor coverage appears to be generally acceptable with 85.9% of respondents reporting that their visors could be lowered to a satisfactory position. However, 18.3% of IHADSS and

11.8% of HGU-56/P respondents were not satisfied with the coverage provided by the visors in these helmets.

Problems with deploying visors were also an issue with 43.1% of all respondents reporting problems. The SPH-4B (32.4%) was reported as having the least problems, the SPH-4 as having the most (50.0%). When deploying visors, 85.9% of respondents reported that they lock their visor in place. However, a number of respondents (12.5%) reported that their visors would retract inadvertently. This problem was mostly present with the IHADSS, for which 58.8% reported inadvertent retractions. Of these, 35% cited the frequency of incidence as "rarely," 60% as "occasionally," and 5% as "frequently."

Several respondents (18.1%) reported encountering physical problems with the visor rubbing against their nose or face. This problem was present more with the SPH-4 (18.8%) and the SPH-4B (28.4%). The closeness of visors on these helmets may explain the reported incidence of fogging up of the visors. While reported as a problem by 19.6% of all respondents, fogging was reported most with the SPH-4 (25.0%) and least with the IHADSS (14.7%). When the issues of physical compatibility was extended to the cockpit, only 15.3% of all respondents reported problems. The majority of these were associated with IHADSS and HGU-56/P helmets. IHADSS wearers reported that the visor hits the optical relay tube (ORT) in the front seat, causing the visor to retract. HGU-56/P wearers reported difficulty in reading the multifunction displays (MFDs).

For wearers of IHADSS helmet, the most cited visor related problem was with the use of the SPH-4 ANVIS visor mount (23.5%). Apparently these visors rest close to the face (causing nose rubs) and are not cut for HDU use. This poses a safety hazzard if ANVIS failure occurs. The next most cited problem was the lack of a dual visor configuration (20.1%) which results in continuously switching out the clear or tinted visor or selecting one visor for use for all flights. Other problems reported include: difficulty in cleaning (2.9%), edge distortion (2.9%), scratches (5.9%), and interfacing with the HDU (8.8%) (a reference to the visor trim required for the HDU).

The major problem with the HGU-56/P was the visor sticking in the tracks. This problem was cited by 32% of the respondents. This problem is attributed to dirt which lodges in the tracks. Additional problems include: scratches (3.1%), not providing sufficient coverage (4.7%), locking/unlocking (3.1%), and inability to wear visor with ANVIS (2%).

Problems with difficulty in locking/unlocking (12.5%), decreased visual acuity (12.5), and nose rubs (12.5%) were reported with the SPH-4 visor assemblies.

SPH-4B problems include: sticks in tracks (14.9%), cleaning (6.8%), nose rubs (5.4%), scratches (2.7%), and fogging (2.7%).

When asked to choose between a single or a dual visor assembly configuration, 87.4% preferred the dual visor assembly. It can be noted that respondents currently using the SPH-4B and HGU-56/P dual assemblies preferred dual over single by a total of 93.6%. However, users of single visor helmets, IHADSS and SPH-4, also preferred the dual configuration (62%).

Data regarding local post or unit policy on visor usage seem to indicate that a universal policy is not in place Armywide. The majority, 61.5%, reported no written policy and use being left up to the aviator's discretion. Only 8.6% reported a "wear at all times" unit policy. However, 31.4% reported that their unit policy was to wear during certain specific tasks, e.g., gunnery and refueling.

Respondents were asked to rate overall satisfaction with their current visor assembly using a scale of 1 to 5, where 1 was "poor" and 5 was "very good." The mean rating across all respondents was 3.9 (4 = "good"). Individually, both HGU-56/P and SPH-4B assemblies averaged a rating of 4.0. The mean ratings for the IHADSS and SPH-4 were 3.7 and 3.6, respectively.

Optical quality

Survey questions on optical quality addressed the presence of haze, distortion, prismatic deviation, tint, and use of laser visors.

Few problems with haze were reported. Overall, only 9.8% of the respondents considered haze to be an issue. An even smaller percentage reported experiencing problems with prismatic deviation (3.9%) or distortion (3.9%). In each case, the visors on the SPH-4 had the highest reported frequency.

When asked to describe the current condition of their visor(s), the majority (67.8%) claimed to maintain clean visors. The presence of pits (2.8%) and cracks (0.4%) were minimal, but 29% of all respondents described scratches as being present. Scratches were most frequently reported for IHADSS visors (64.7%).

The Class II visor is tinted. MIL-V-4311C defines a Class II visor as having a visible transmittance of 12 - 18%. An exception is the IHADSS tinted visor, which has a transmittance of 8 - 12%. Besides the standard role of protection, the tinted visor reduces glare and improves performance under "bright" daylight lighting conditions. Overall, 80.0% of respondents assessed the tint of their Class II visor to be "just right," with 5.9% assessing theirs as "too dark" and 10.2% as "not dark enough."

Some of the respondents reported having access to and using a laser visor (7.1%). Laser visors have been available in 3 versions: 1-notch, 2-notch, and 3-notch. In the survey the 2-notch visors (those protecting against 2 threat wavelengths) were the most commonly reported.

When asked to report on the tint of and color discrimination with the laser visors, neither were reported as a significant problem. However, a minor percentage of respondents (2.8%) did mention some difficulties in reading some of the panel-mounted displays.

Maintenance

Survey questions on maintenance included questions on visor inspection, repair, and availability of repair parts.

Visor susceptibility to scratching is a common problem, with scratched visors having been reported by 45.9% of the respondents. At 64.7%, the IHADSS visors seem to be the most prone to this problem.

Helmets are required generally to be inspected once every 120 days. This inspection is usually performed by the local Aviation Life Support Equipment (ALSE) shop. This inspection should include the visor(s). When asked about the inspection procedure, the majority of respondents (68.6%) reported the 120 day inspection period. A significant number reported 90 days (23.1%). Most of the respondents (89.8%) were confident that this inspection did include the visor(s).

A little over a third of the respondents (36.9%) reported that they had never been instructed on wearing their visors. Of the 61.6% who had received instruction, over half (55.4%) reported having received it from ALSE personnel. Of those respondents who indicated they had received instruction, the majority listed Fort Rucker, Alabama, as where they had received this instruction.

Having a visor fall out of the helmet was an occurrence reported by 8.6% of the respondents. The helmet with the highest reported frequency was the SPH-4 (18.8%).

Aviators appear to make a more than modest attempt to keep their visors clean. Methods include rubbing alcohol (2.8%), commercial glass cleaner (26.3%), soap and water (18.0%), wet cloth (30.6%), dry cloth (26.7%), and paper towels (15.3%). Most aviators use more than one method, based on availability.

Approximately one-fourth (27.5%) of respondents reported having had to replace one or more visors during their flight career. The reasons included scratched (50.0%), broken (18.5%), and cracked (12.9%). A total of 36.5% reported having to have the visor assembly repaired. For the most part, repair parts were easily obtainable (85.0%).

Special IHADSS issues

A final questionnaire section was included for IHADSS helmet wearers only. This section addressed the special visor trim required for use with the HDU and how frequently the IHADSS visor assemblies are interchanged by Apache aviators.

IHADSS visors must be trimmed to properly interface with the HDU (Rash et al., 1987). More than one-third (35.3%) of IHADSS respondents reported the trim of their visor as inaccurate and/or inadequate. One aviator reported his visor had to be retrimmed "several times." Another reported that IHADSS helmets were required to be turned in for changes of duty stations. This creates a pool of visors trimmed for the original owner but are reissued to other aviators without retrimming. Aviators must "shop around" in this pool to find one that is a close enough fit.

The IHADSS has a single visor configuration, but a thumbscrew design allows easy switching from one visor to another (e.g., from clear to tinted). However, only 61.8% of IHADSS respondents reported that they actually switch visors. Almost one-third (32.3%) do not. Of those that do switch, only 19.1% do so frequently. This means approximately only 1 out of 10 Apache aviators routinely use both visors. Most (80.9%) of those reporting that they do switch said they do so only occasionally or rarely. The use of the specialized SPH-4 ANVIS mount and visor further complicates this issue.

Discussion and summary

Visors are important to both aviators and aircrew. They provide a level of comfort and protection from sun, wind, dust, and, in the case of crash, debris. Accident data show that visors play a major role in reducing the incidence and severity of facial injuries.

This study shows that visors are used by the majority of aviators during day flights. However, not by all aviators. Visor use is further compromised due to aviator inability to deploy visors when using ANVIS during night time operations. The Army lacks a clear Armywide policy on visor use. Single visor configurations further reduce visor use. Aviators are not willing to accept the logistical problem of replacing visor assemblies, even when the switching procedure is greatly simplified, as with the IHADSS helmet. Dual visor configurations improve the probability that both clear and tinted visors will be available for use.

Optical quality is reported as generally good, with only minor problems with haze, distortion, luminous transmittance, and prismatic deviation. However, the study identifies a number of mechanical problems. These include visors sticking in tracks; being difficult to lock, unlock, and deploy; coming off track; and inadvertent retraction.

Visor maintenance, to include inspection, and repair, does not appear to be a issue. Frequent visor inspections by ALSE specialists are standard. When required, repairs are made in a timely fashion.

Aviators seem to routinely clean their visors. However, in the apparent absence of formal education in the care and maintenance of visors, a variety of methods and materials are used. Some of these result in increased scratching of the visor surfaces. Gentex recommends cleaning visors with soapy water and a soft, clean cloth.

The special visors used with the IHADSS helmet have unique issues. These visors must be trimmed in order to be compatible with the IHADSS HMD. More than a third of IHADSS aviators surveyed reported problems with the trim of their visors. The trimming process is not a trivial procedure and must be performed by experienced personnel. This problem is exacerbated by the requirement to turn in the specially trimmed visors when changing duty stations and the policy of some units to reissue previously trimmed IHADSS visors.

Recommendations

Based upon data on visor use reported herein, the following recommendations are provided:

1. Require all future aviation helmet designs to utilize dual visor assemblies.

2. Improve education of aviators on visor usage, care, and maintenance.

3. Develop guidelines for visor use. Identify tasks, procedures, and flight scenarios where visor deployment is required or recommended.

4. Investigate visor mount designs which will allow deployment of visors when using ANVIS.

5. Recall SPH-4 helmets. SPH-4 helmet visor use is the lowest of all fielded helmets. Two generations of common aviator protective helmets, the SPH-4B and the HGU-56/P, have been fielded since the SPH-4 helmet. These newer helmet designs provide improved acoustical and impact protection and encourage increased visor use.

6. Establish policy in AH-64 units which allows IHADSS aviators to carry their specially trimmed visors with them when transferring to new duty station.

7. Investigate a solution to the need to replace standard IHADSS visors with a specialized SPH-4 ANVIS mount and visor for ANVIS night operations in the AH-64.

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Appendix A.

Visor use survey questionnaire.

Visor Use Survey

In a continuing effort to better protect and serve the aviator, the U.S. Army Aeromedical Research Laboratory (USAARL), Fort Rucker, Alabama, is studying the functionality of visors issued with aviator helmets.

It is important that you answer the questions as accurately and fully as possible. These data will be used as a reference for future design of the visors and visor assemblies.

Both you and your responses will remain anonymous. The data collected will be used for research purposes only. They will not become part of your record, nor will they be used to make any determination about you.

Please answer the appropriate questions for the helmet and visors you have worn **most** within the **last** year. For additional helmets you have worn during this period, please fill out a separate form. Your sincere consideration and time will be greatly appreciated.

If you have any questions, please contact Ed Rash at 334-255-6814 (DSN 558) or Becky Ivey at 334-255-6981.

Please complete and sign the Volunteer Agreement Affidavit attached to this document. Once you have completed the survey, separate it to ensure the anonymity of your responses.

Thank you.

DIRECTIONS: Please circle the appropriate response:

I. <u>DEMOGRAPHICS</u>

a. Sex: Male Female

b. Current duty status: Pilot Co-pilot/Gunner Flight crew

c. Approximate total flight hours: _____ hours

d. Primary aircraft type:

AH-1 AH-64 CH-47 OH-6 OH-58A OH-58C OH-58D UH-1 UH-60 TH-67

e. Helmet type: IHADSS HGU-56/P SPH-4B SPH-4

f. Do you wear/use corrective lens? Glasses Contacts None

II. USAGE

a. Which visor(s) do you have available for use?
Clear Tinted Laser Other_____ None

b. Which visor(s) are currently installed in your helmet assembly?
Clear Tinted Laser Other_____ None

c. Assess your percentage of wear of the visors (to the nearest 10%):

Day wear, clear visor _____% Night wear, clear visor _____%

Day wear, tinted visor _____% Night wear, tinted visor _____%

Day wear, no visor _____% Night wear, no visor,
Naked eye _____%

Day wear, laser visor _____% NVG _____%

Day wear, other visor _____% Night wear, laser visor _____%

TOTAL 100 %

Night wear, other visor _____

Total 100 %

d. Check any mechanical difficulties you have experienced with your visor assembly:

_____ Broken latches _____ Difficult to lock/unlock _____Vibrates (rattles)

_____ Comes off track _____ Sticks in tracks _____Missing parts (knobs, etc.)

_____Other_____

e. Does your visor(s) come down far enough? Yes No

f. Do you have problems raising and lowering your visor? Yes No

g. When you lower your visor, do you lock your visor into position? Yes No

h. Has your visor ever inadvertently retracted? Yes No
If yes, how often: Rarely Occasionally Frequently

i. Does the visor adversely rub your nose or face when deployed? Yes No

j. Have you ever had a problem with your visor fogging up? Yes No

k. Which visor assembly configuration do you prefer? Single Dual

l. Do you experience any compatibility problems with other cockpit systems which interfere with your ability to lower your visor?

Yes No

If yes, please explain:_____

_____

m. What is your unit's policy for visor use?

_____Use at all times _____Required for specific tasks (such as_____)

_____Use at pilot's discretion _____No policy

n. What is your biggest problem with the use of your visor/visor assembly? _____

_____

o. Rate your overall satisfaction with your visor(s) and visor assembly on a scale from 1 to 5:

Very poor	Poor	Borderline	Good	Very good
1	2	3	4	5

III. OPTICAL QUALITY

a. Do you experience problems with excessive haze (light scatter) caused by your visor?

Yes No

b. Do you have problems with prismatic deviation (object/image displacement) when using your visor?

Yes

No

c. Do you have problems with distortion (waviness) when using your visor? Yes No

d. Circle all that describe the current condition of your visor:

Clean Dirty Pitted Scratched Cracked

e. Is the tint on your tinted sun visor: Too dark Just right Not dark enough

f. Is your laser visor: 1-notch 2-notch 3-notch No laser visor

g. Is the tint of your laser visor:

Too dark Just right Not dark enough No laser visor

h. When using a laser visor, do you experience compatibility problems with cockpit displays due to the color deviation (color change)? Yes No No laser visor

If yes, what:_____

IV. MAINTENANCE

a. Is the visor easily scratched? Yes No

b. How often is your helmet inspected? _____days

c. Is the visor included in the helmet inspection? Yes No

d. Have you ever been instructed on how to properly wear your visor? Yes No

If so, by whom/where?_____

e. Has your visor ever fallen out? Yes No

f. Circle the method you use for cleaning your visor:
rubbing alcohol glass cleaner soap and water wet cloth

dry cloth paper towels other_____

g. Has your visor ever been replaced? Yes No
If yes, for what reason_____

h. Have you ever had to repair part of the visor assembly on your helmet? Yes No

If yes, were replacement parts readily available? Yes No

V. FOR IHADSS USERS ONLY

a. Was the custom trimming of the visor accurate and adequate? Yes No
Remarks:_____

b. Do you switch visor housings? Yes No

If yes, how often: Rarely Occasionally Frequently

Please comment on any other problems regarding your visor and visor assembly (no matter how general or specific in nature) not previously addressed:

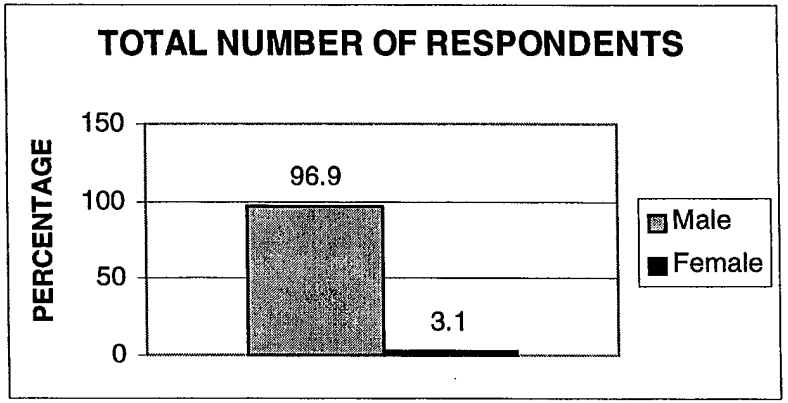
_____

Appendix B.

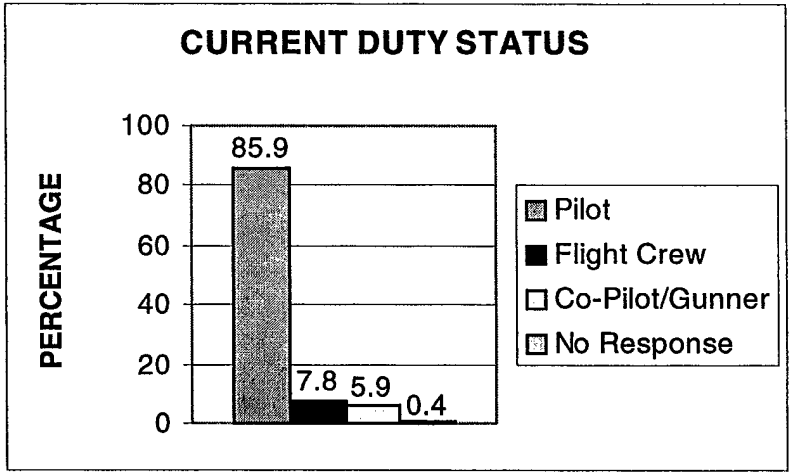
Questionnaire data.

I. DEMOGRAPHICS

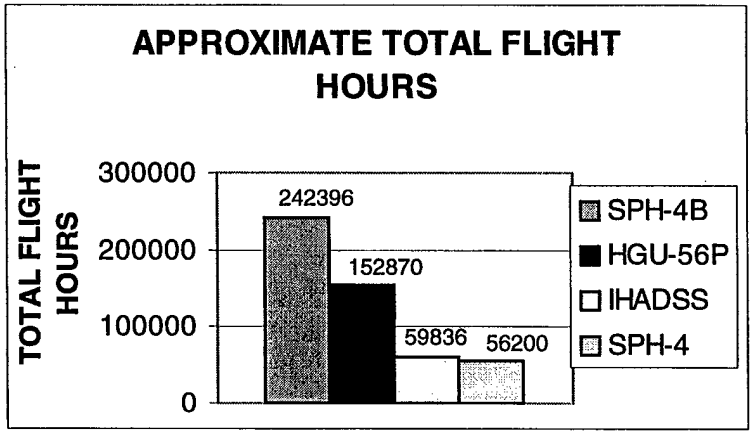
a. Sex: Male (96.9%) Female (3.1%)



b. Current duty status: Pilot (85.9%) Co-Pilot/Gunner (5.9%)
Flight crew (7.8%) No Response (0.4%)

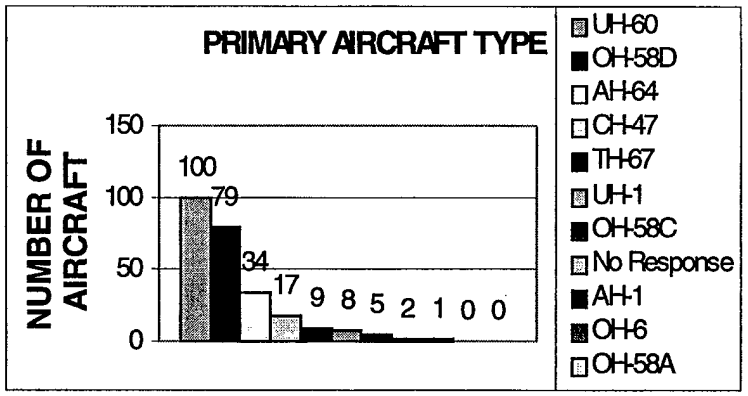


c. Approximate total flight hours: 511,302

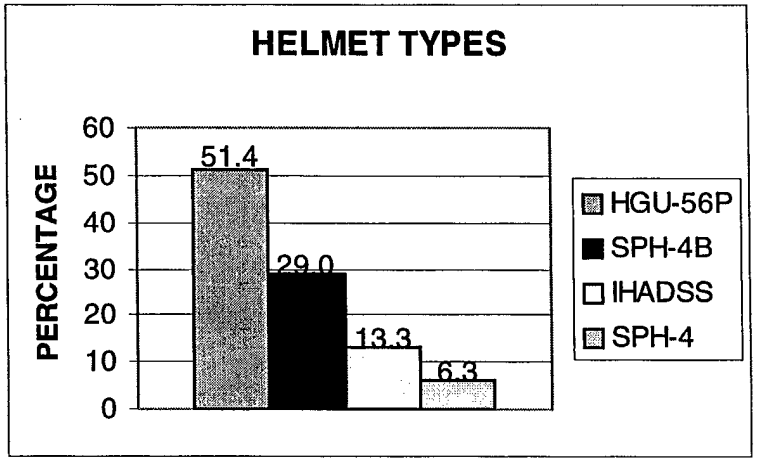


d. Primary aircraft type: AH-1 (1) AH-64 (34) CH-47 (17) OH-6 (0) OH-58A (0)
OH-58C (5) OH-58D (79) UH-1 (8) UH-60 (100) TH-67 (9)
No Response (2)

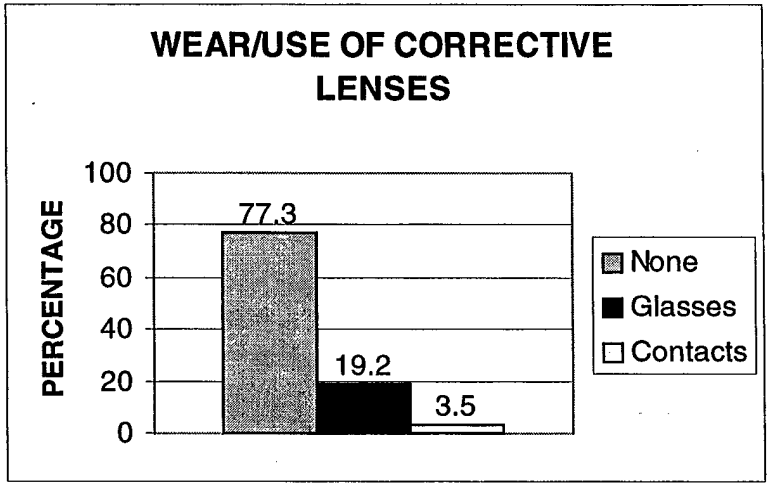
NOTE: Reported as number of aircraft.



e. All helmet types: IHADSS (13.3%) HGU-56P (51.4%) SPH-4B (29.0%) SPH-4 (6.3%)



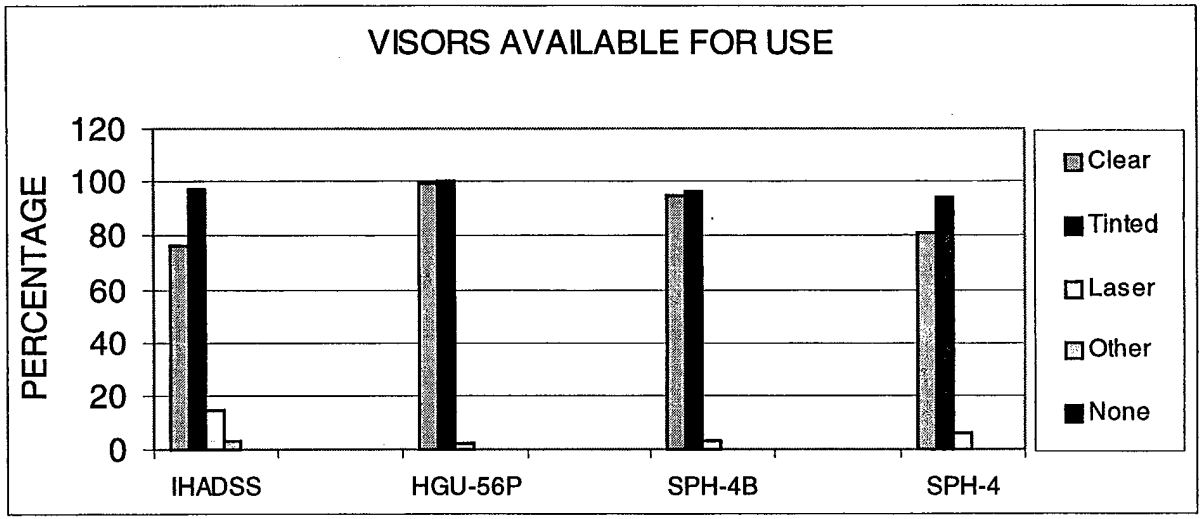
f. Do you wear/use corrective lens? Glasses (19.2%) Contacts (3.5%) None (77.3%)



II. USAGE

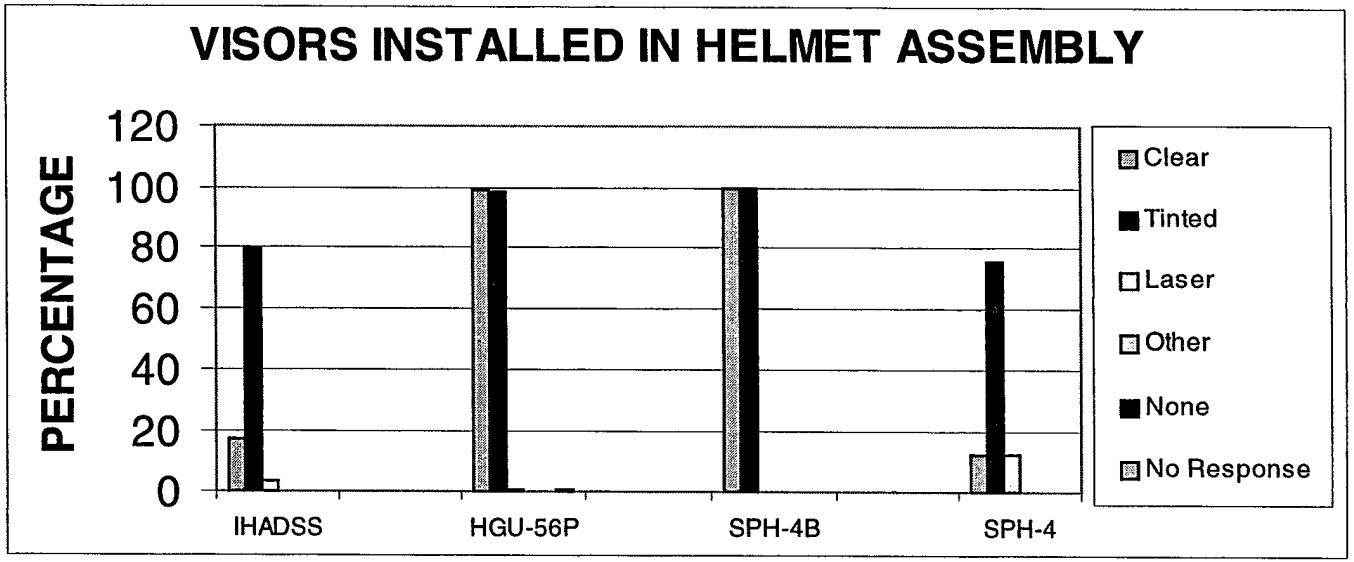
a. Which visors do you have available for use?

IHADSS: (n=34)	Clear (76.5%)	Tinted (97.1%)	Laser (14.7%)	Other (*2.9%) * NVG	None (0%)
HGU-56P: (n=131)	Clear (99.2%)	Tinted (100%)	Laser (2.3%)	Other (0%)	None (0%)
SPH-4B: (n=74)	Clear (94.6%)	Tinted (96.0%)	Laser (2.7%)	Other (0%)	None (0%)
SPH-4: (n=16)	Clear (81.3%)	Tinted (93.8%)	Laser (6.25%)	Other (0%)	None (0%)



b. Which visor(s) are currently installed in your helmet assembly?

IHADSS:	Clear	Tinted	Laser	Other	None	No Response
(n=29)	(17.2%)	(79.3%)	(3.4%)	(0%)	(0%)	(0%)
	*Five respondents provided confounding responses.					
HGU-56P:	Clear	Tinted	Laser	Other	None	No Response
(n=129)	(99.2%)	(98.4%)	(0.8%)	(0%)	(0%)	(0.8%)
	*Two respondents provided confounding responses.					
SPH-4B:	Clear	Tinted	Laser	Other	None	No Response
(n=65)	(100%)	(100%)	(0%)	(0%)	(0%)	(0%)
	*Nine respondents provided confounding responses.					
SPH-4:	Clear	Tinted	Laser	Other	None	No Response
(n=8)	(12.5%)	(75.0%)	(12.5%)	(0%)	(0%)	(0%)
	*Eight respondents provided confounding responses.					



c. Assess your percentage of wear of the visors (to the nearest 10%):

NOTE: Values expressed are averages across respondents.

IHADSS (n=34)

Day wear, clear visor	4%	Night wear, clear visor	8%
Day wear, tinted visor	55%	Night wear, tinted visor	2%
Day wear, no visor	38%	Night wear, no visor	55%
Day wear, laser visor	3%	Night wear, no visor, NVG	29%
Day wear, other visor	0%	Night wear, laser visor	4%
		Night wear, other visor	0%

HGU-56P (n=131)

Day wear, clear visor	12%	Night wear, clear visor	11%
Day wear, tinted visor	67%	Night wear, tinted visor	1%
Day wear, no visor	18%	Night wear, no visor	16%
Day wear, laser visor	0%	Night wear, no visor, NVG	66%
Day wear, other visor	1%	Night wear, laser visor	0%
		Night wear, other visor	0%

SPH-4B (n=74)

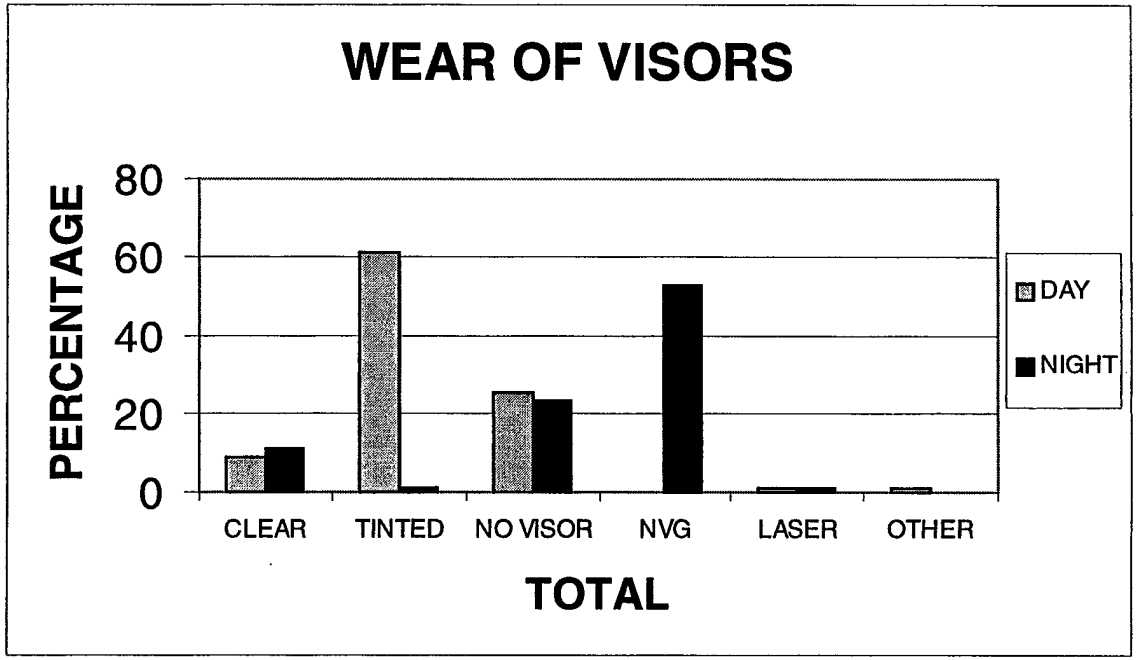
Day wear, clear visor	8%	Night wear, clear visor	15%
Day wear, tinted visor	58%	Night wear, tinted visor	0%
Day wear, no visor	28%	Night wear, no visor	22%
Day wear, laser visor	1%	Night wear, no visor, NVG	45%
Day wear, other visor	0%	Night wear, laser visor	0%
		Night wear, other visor	1%

SPH-4 (n=16)

Day wear, clear visor	5%	Night wear, clear visor	1%
Day wear, tinted visor	46%	Night wear, tinted visor	0%
Day wear, no visor	48%	Night wear, no visor	22%
Day wear, laser visor	2%	Night wear, no visor, NVG	36%
Day wear, other visor	0%	Night wear, laser visor	0%
		Night wear, other visor	3%

TOTAL (n=255)

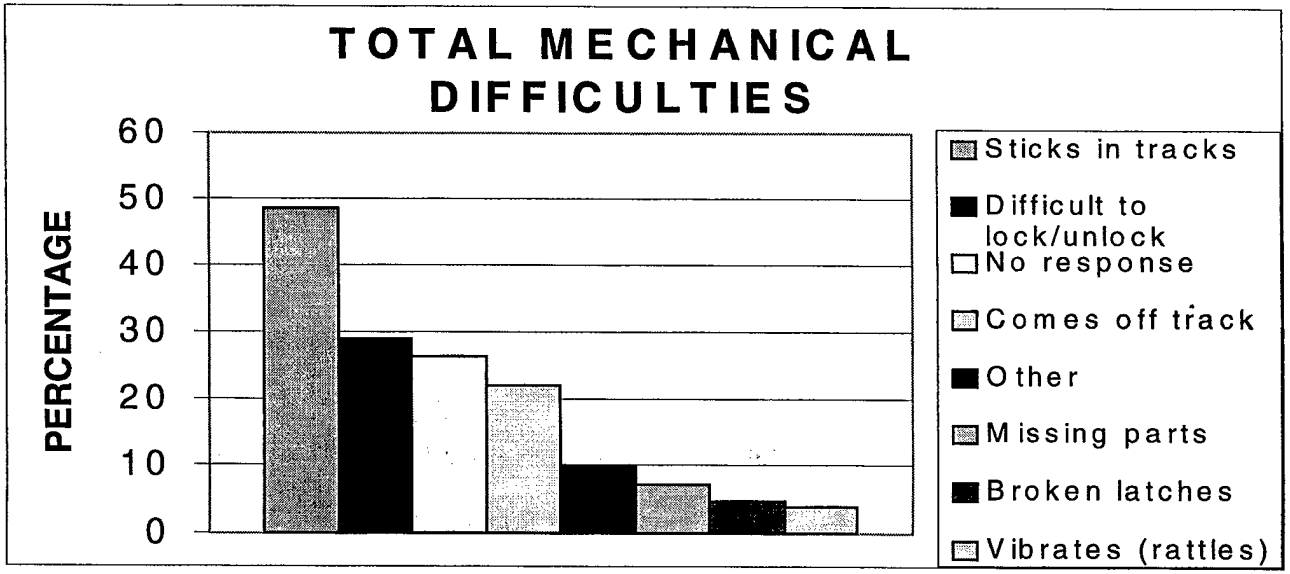
Day wear, clear visor	9%	Night wear, clear visor	11%
Day wear, tinted visor	61%	Night wear, tinted visor	1%
Day wear, no visor	25%	Night wear, no visor	23%
Day wear, laser visor	1%	Night wear, no visor, NVG	53%
Day wear, other visor	1%	Night wear, laser visor	1%
		Night wear, other visor	0%



d. Check any mechanical difficulties you have experienced with your visor assembly:

	IHADSS (n=34)	HGU-56P (n=131)	SPH-4B (n=74)	SPH-4 (n=16)	Total (n=255)
Broken latches	5.9%	3.8%	6.8%	0%	4.7%
Difficult to lock/unlock	26.5%	31.3%	27.0%	25.0%	29.0%
Vibrates (rattles)	0%	1.5%	10.8%	0%	3.9%
Comes off track	14.7%	23.7%	24.3%	18.8%	22.0%
Sticks in tracks	55.9%	51.9%	44.6%	31.3%	48.6%
Missing parts (knobs, etc.)	11.8%	2.3%	10.8%	12.5%	7.1%
Other	20.6%	8.3%	8.1%	6.3%	9.8%
No response*	17.6%	25.2%	31.1%	31.3%	26.3%

* Questionnaire failed to provide option of "No problems;" therefore, a "No response" may indicate that there were no problems.



Comments:

(IHADSS) "Visor separating from track guide (poor adhesive)"
"Difficult to change visors"
"Unlocks on its own"

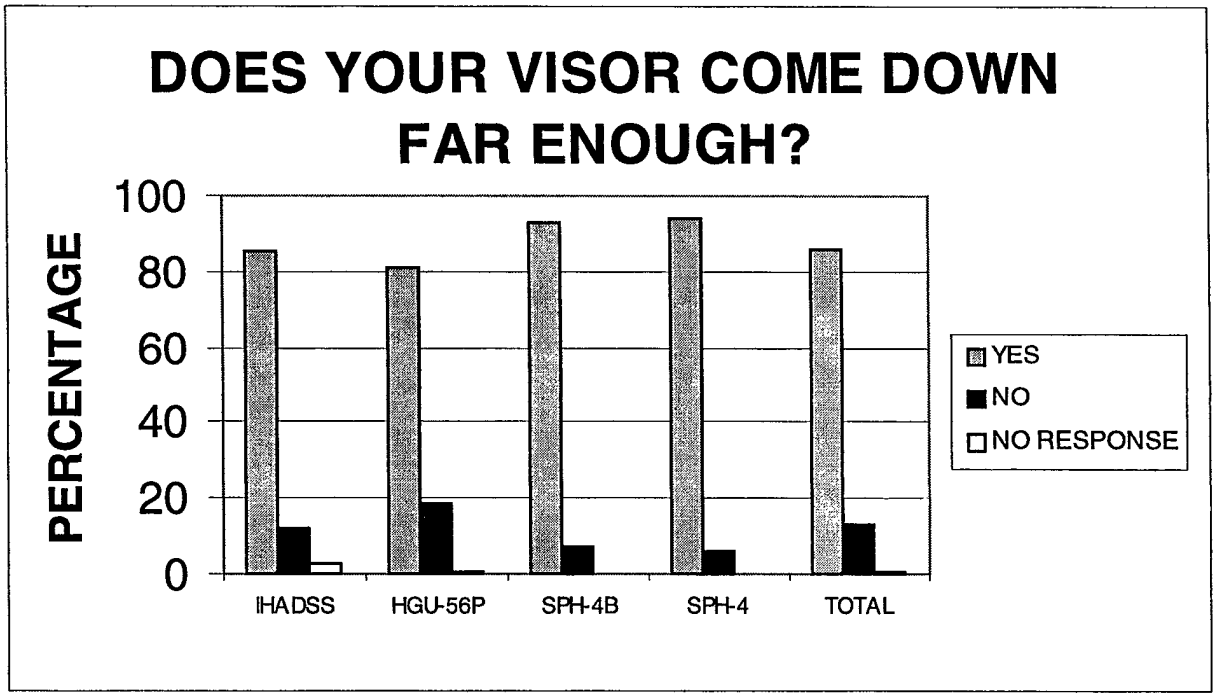
(HGU-56P) "Does not seem to come down as far as my SPH-4B helmet causing an unclear view"
"Needs more adjustment notches, it is either too high or too low"
"When dirt gets in tracks, visor will not go up or down"
"Visor screws become loose (2)"
"Parts vibrate loose"

(SPH-4B) "Knobs come loose"
"...screws loosen after successive flights"
"Visor does not slide down enough"
"Visor scratches in up position"

(SPH-4) "Sometimes difficult to put down because the release mechanism is on one side (only)"

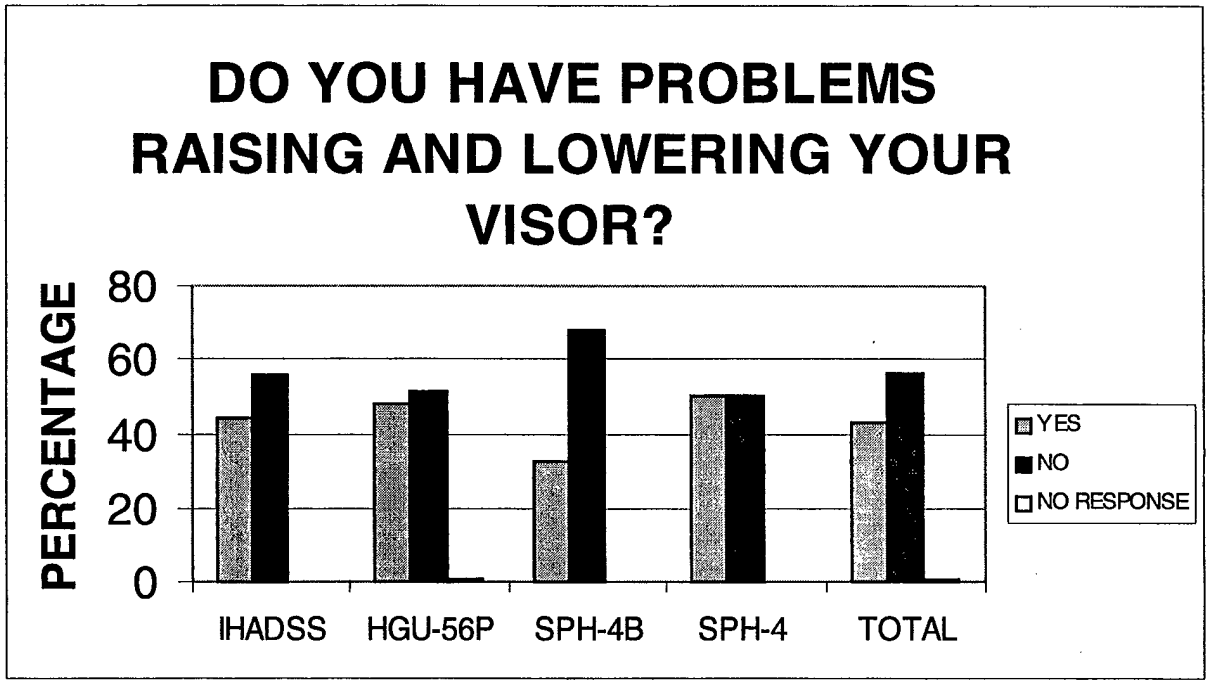
e. Does your visor(s) come down far enough?

	IHADSS (n=34)	HGU-56P (n=131)	SPH-4B (n=74)	SPH-4 (n=16)	Total (n=255)
Yes	85.3%	80.9%	93.2%	93.8%	85.9%
No	11.8%	18.3%	6.8%	6.2%	13.3%
No Response	2.9%	0.8%	0%	0%	0.8%



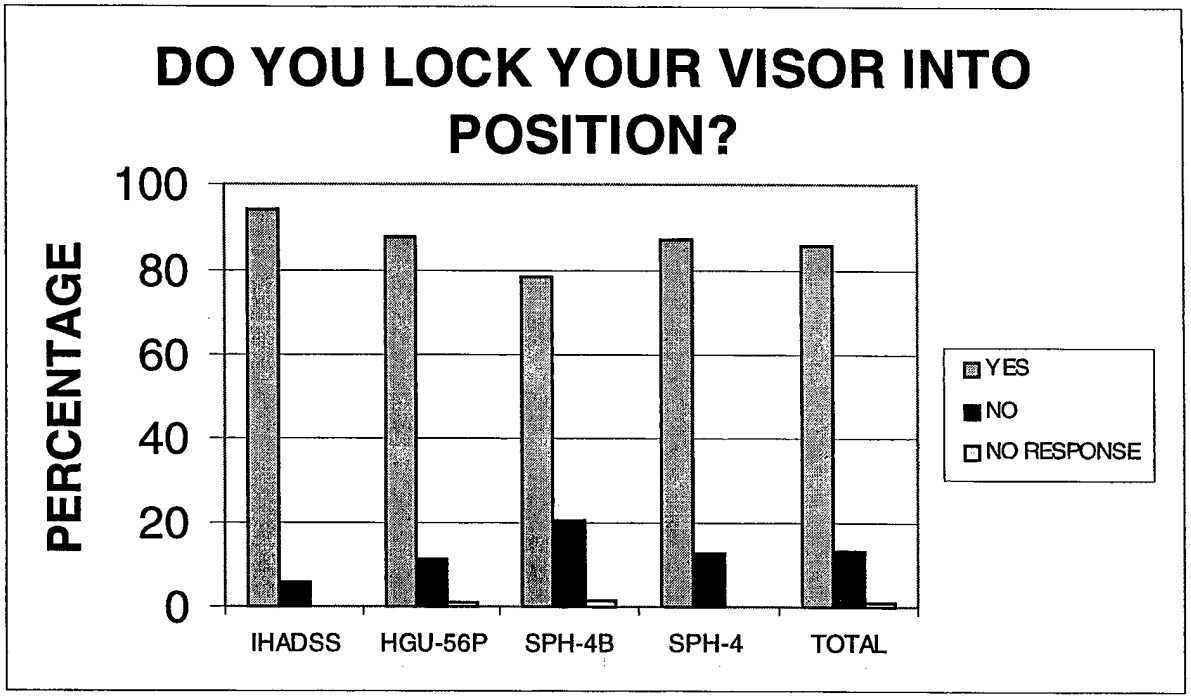
f. Do you have problems raising and lowering your visor?

	IHADSS (n=34)	HGU-56P (n=131)	SPH-4B (n=74)	SPH-4 (n=16)	Total (n=255)
Yes	44.1%	48.1%	32.4%	50.0%	43.1%
No	55.9%	51.1%	67.6%	50.0%	56.5%
No Response	0%	0.8%	0%	0%	0.4%



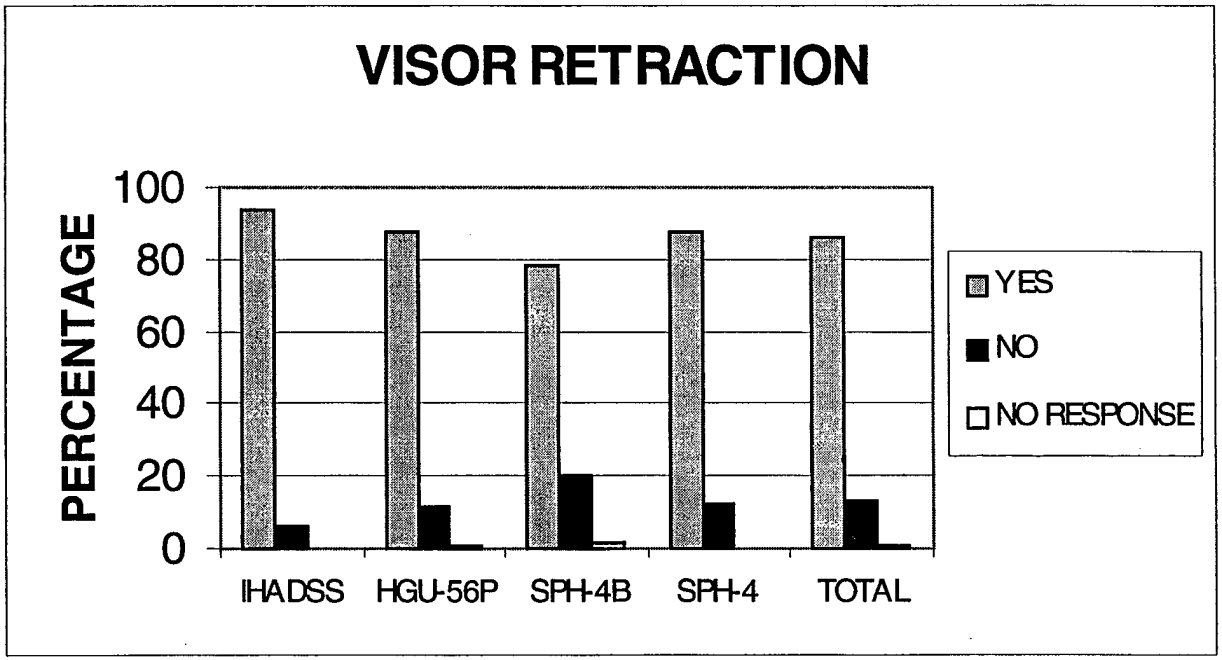
g. When you lower your visor, do you lock your visor into position?

	IHADSS (n=34)	HGU-56P (n=131)	SPH-4B (n=74)	SPH-4 (n=16)	Total (n=255)
Yes	94.1%	87.8%	78.4%	87.5%	85.9%
No	5.9%	11.4%	20.3%	12.5%	13.3%
No Response	0%	0.8%	1.3%	0%	0.8%



h. Has your visor inadvertently retracted?

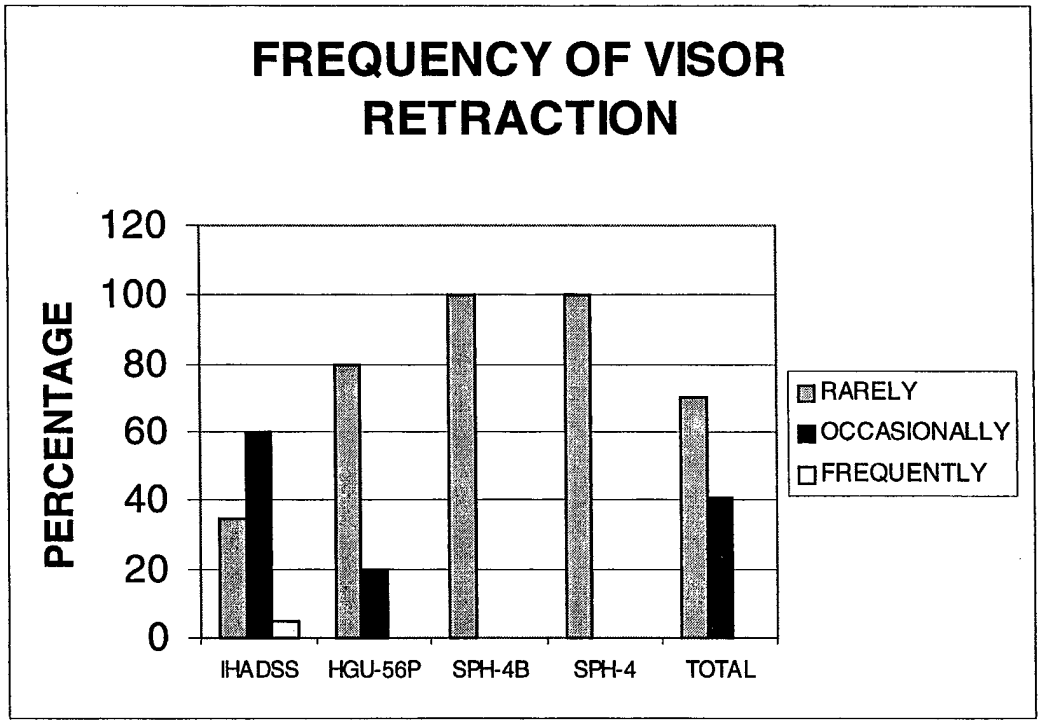
	IHADSS (n=34)	HGU-56P (n=131)	SPH-4B (n=74)	SPH-4 (n=16)	Total (n=255)
Yes	58.8%	3.8%	8.0%	6.3%	12.5%
No	41.2%	95.4%	92.0%	93.7%	87.1%
No Response	0%	0.8%	0%	0%	0.4%



h.1. If yes, how often:

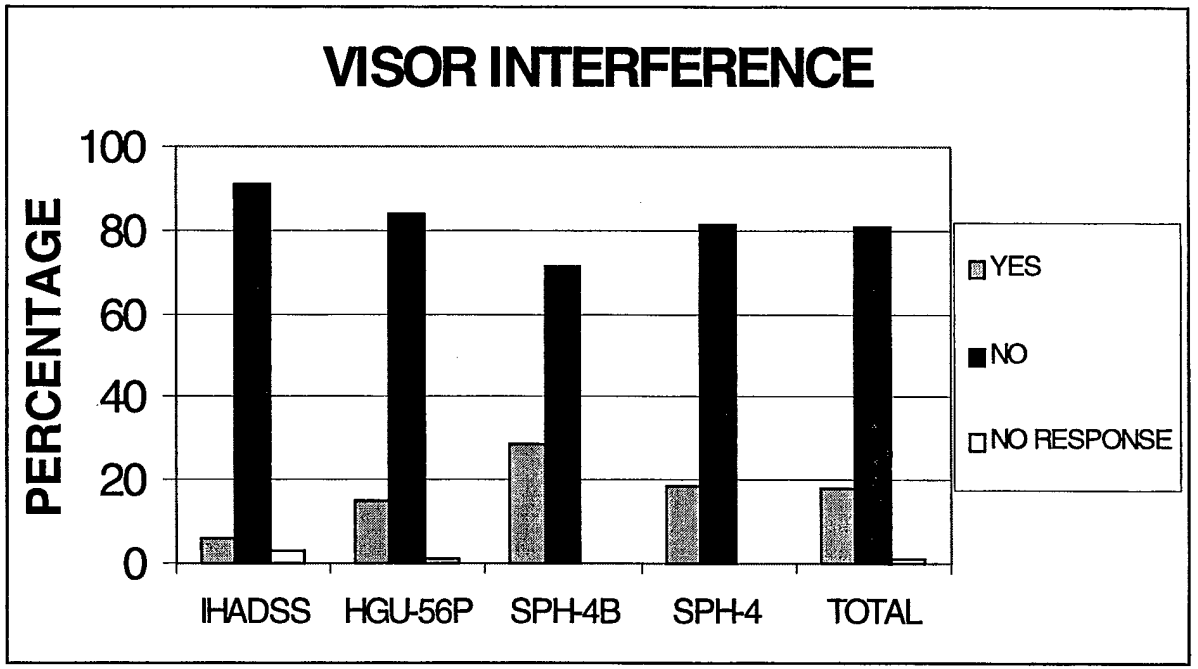
Percentages based only on YES responses

	IHADSS	HGU-56P	SPH-4B	SPH-4	Total
Rarely	35.0%	80.0%	100%	100%	70.3%
Occasionally	60.0%	20.0%	0%	0%	41.1%
Frequently	5.0%	0%	0%	0%	0.28%



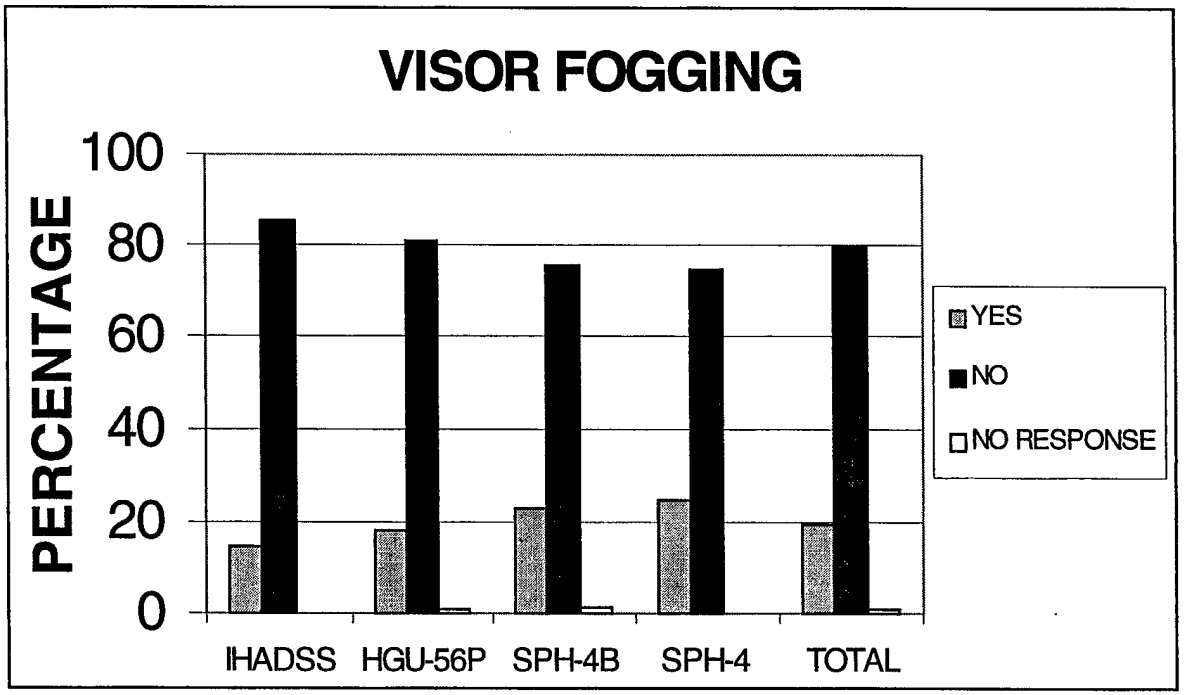
i. Does your visor adversely rub your nose or face when deployed?

	IHADSS (n=34)	HGU-56P (n=131)	SPH-4B (n=74)	SPH-4 (n=16)	Total (n=255)
Yes	5.9%	15.3%	28.4%	18.8%	18.1%
No	91.2%	83.9%	71.6%	81.3%	81.1%
No Response	2.9%	0.8%	0%	0%	0.8%



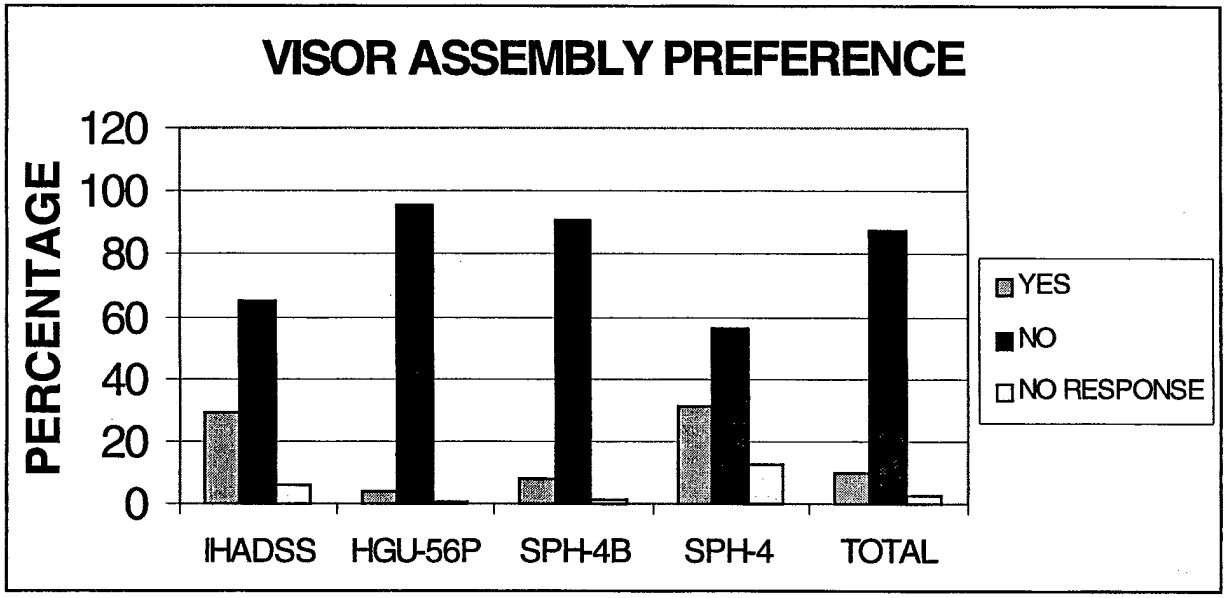
j. Have you ever had a problem with your visor fogging up?

	IHADSS (n=34)	HGU-56P (n=131)	SPH-4B (n=74)	SPH-4 (n=16)	Total (n=255)
Yes	14.7%	18.3%	22.9%	25.0%	19.6%
No	85.3%	80.9%	75.7%	75.0%	79.6%
No Response	0%	0.8%	1.4%	0%	0.8%



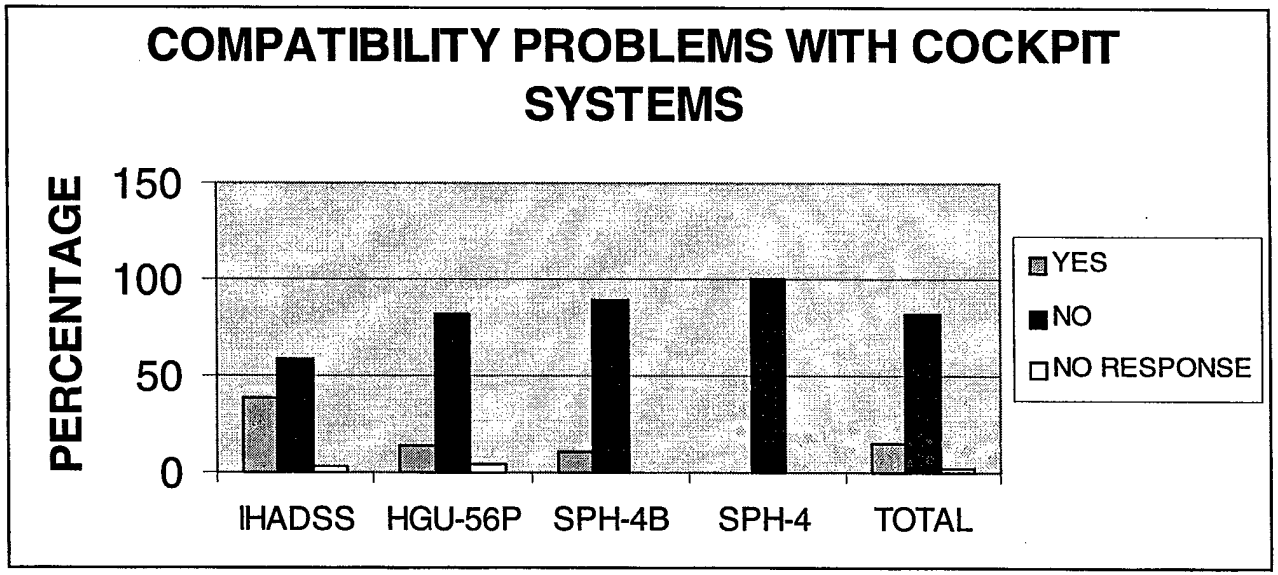
k. Which visor assembly configuration do you prefer?

	IHADSS (n=34)	HGU-56P (n=131)	SPH-4B (n=74)	SPH-4 (n=16)	Total (n=255)
Single	29.4%	3.8%	8.1%	31.3%	10.2%
Dual	64.7%	95.4%	90.5%	56.3%	87.4%
No Response	5.9%	0.8%	1.4%	12.5%	2.4%



1. Do you experience any compatibility problems with other cockpit systems which interfere with your ability to lower your visor?

	IHADSS (n=34)	HGU-56P (n=131)	SPH-4B (n=74)	SPH-4 (n=16)	Total (n=255)
Yes	38.2%	13.7%	10.8%	0%	15.3%
No	58.8%	82.4%	89.2%	100%	82.3%
No Response	2.9%	3.8%	0%	0%	2.3%



1.1. If YES please explain:

Comments: (IHADSS) "Unable to use visor with IHADSS HDU (helmet display unit) if the visor is not cut (4)"
"IHADSS helmet visor hits ORT (optical relay tube) in front seat, causes it to retract"
"NVG (night vision goggle) mount visor doesn't allow use of HDU very well (4)"
"NVG users in the Apache have to wear an SPH-4 visor and we are unable to lower over the HDU (2)"

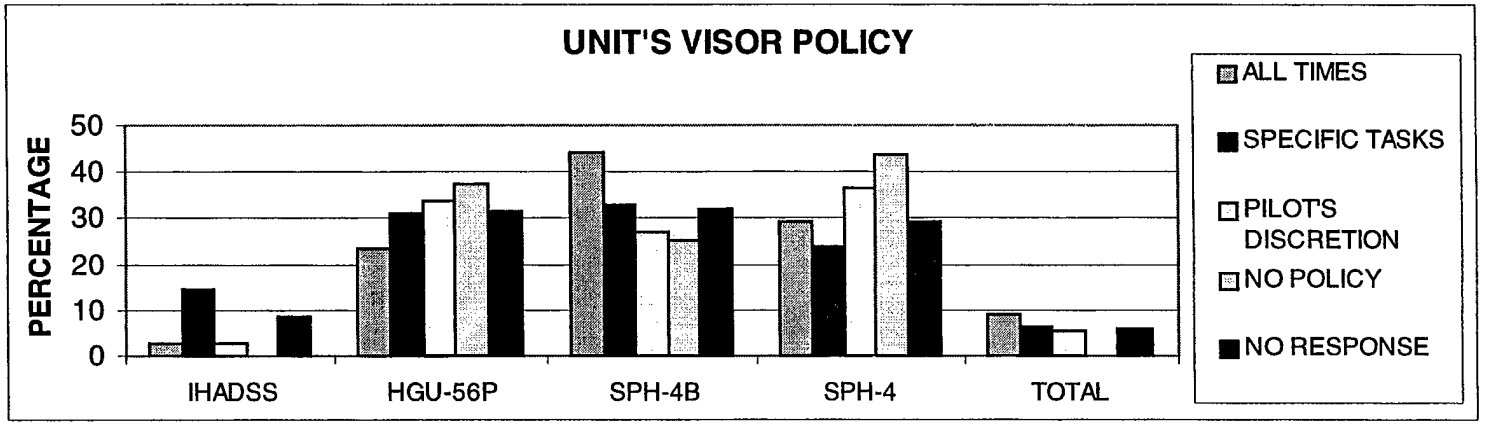
(HGU-56P) "Glasses cause excessive glare when visor is down"
"Can't use with NVGs (10)"
"Too hard to raise quickly"
"Tinted visor bleeds out MFDs (multifunction displays) (ie: green display/green visor) (2)"
"Often tinted visor makes CDS (control and display system) unreadable"
"Visor does not lower far enough"

(SPH-4B) "NVG can get in the way, but I only use visor at night during refuel"
"NVGs (causes problems) (2)"
"O_2 mask sometimes presents locking visor down"
"Limited - Selection of either visor with the left hand would be nice that way the right hand can remain on the cyclic"
"Glare which causes some instruments to be unreadable"

m. What is your unit's policy for visor use?

	IHADSS* (n=34)	HGU-56P** (n=131)	SPH-4B*** (n=74)	SPH-4**** (n=16)	Total (n=255)
Use at all times	2.9%	14.5%	2.7%	0%	8.6%
Required for specific tasks (such as gunnery, refuel, etc.)	23.5%	31.3%	33.8%	37.5%	31.4%
Use at pilot's discretion	44.1%	32.8%	27.0%	25.0%	32.1%
No policy	29.4%	23.7%	36.5%	43.8%	29.4%
No response	8.8%	6.1%	5.4%	0%	5.9%

*Three respondents provided two responses each.
**Eleven respondents provided two responses each.
***Four respondents provided two responses each.
****One respondent provided two responses.



n. What is your biggest problem with the use of your visor/visor assembly?

Comments: (IHADSS) "If I had a goggle failure, it would take too long to get the HDU around the visor and onto my eye"
"Distortion at edge of visor and real world"
"Comes out too far from face and it is not a dual visor"
"Not dual and we fly D/N (day/night) in one mission"
"Too difficult to get visors, if their is a problem with ones visor money is not a good excuse"
"Cleaning"
"Protection, storage, and availability of other (not in use) visor"
"Difficult to use with HDU (2), Must change visor to change lense tinting"
"It is very poor that the visor (tinted) is not UV protective"
"Can not easily change from one visor to another (3)"
"Easily scratches and is an annoyance to vision (3)"
"Must remove IHADSS assembly to install NVG; NVG visor poor fit, visor hits nose (2)"
"Switching to ANVIS (Aviator Night Vision Imaging System) visor"
"HDU doesn't fit well with visor on (NVG mount visor)"
"Wear a NVG mount on an IHADSS so only one visor is available"
"HDU is not on the ANVIS visor"
"Difficult to retract / employ (4)"

(HGU-56P) "Sticks in tracks (41)" (attributed to dirt)
"Locking in up or down position (2)"
"Can't put visor all the way down it hits my nose (3)
"Scratches easily (4)"
"Does not come down far enough (6), lower edge is distracting"
"No laser visor available and during the day we fly NVG's most often"
"Fogging when I bring the visor down"
"Need better laser visor (2)"
"As a non-rated crewmember, it would be nice if we could use the visor in conjunction with AN/AVS-6 (ANVIS)"
"UV protection...better off wearing sunglasses during the day (2)"

"Current (eyeglasses) Aviator Flight Frames will reflect onto the visor, the flight frames should be black"
"Cleanliness (2)"
"Reduced clarity"
"Reduces visibility due to reflection, scratches and dust"
"Can be seen by peripheral vision, is distracting and annoying (2)"
"Too hard to lock and unlock (2)"
"Takes two hands to raise and lower (2)"
"Can't wear NVG's close to eyes and use visor (2)"

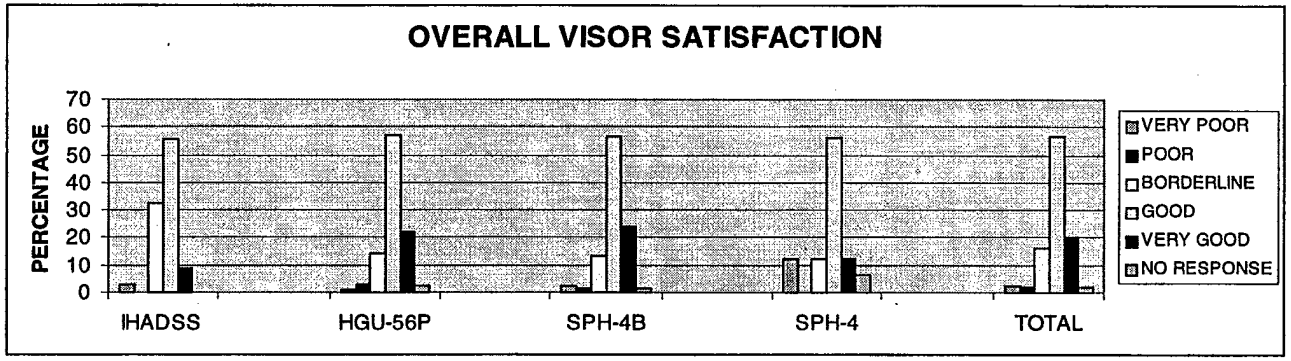
(SPH-4B) "Visor fogs up (2), in bright light clear lense reflects light degrading visibility"
"Scratches (2)"
"Left handed operation of the tinted visor (3)"
"Raising and lowering the laser visor with the left side control and dual visor configuration"
"Visor sticks (11)"
"The latch for tinted visor on dual assembly for SPH-4B is not very durable (2)"
"Tinted visor and tinted windscreen in TH-67 make dark cockpit"
"I seem not to see a shape, as I think it could be. Also, the dual visor will not let the NVG's come back as far as I would like"
"Hits or gets caught on eyeglasses"
"Rotating knob coming loose"
"Glare"
"Cuts into nose (4)"
"Cleaning the visor (5)"
"Clear visor jams in the track when raising or lowering - still two handed operation, or 2 separate movements to "walk" visor up/down"
"Current visor assembly has detent locks which do not allow for infinite position adjustment"

(SPH-4) "Difficult to lock/unlock"
"Fogging up on hot days from the heat of my face/head"
"Decreased visual acuity (2)"
"Single unit because dual system does not accommodate laser visor (current)"
"Helmet off center - so visor not centered - when lowered rubs my nose"

"Ventilation/dirt"
"Distraction from small scratches and smudges. Visor rubs against my nose"

o. Rate your overall satisfaction with your visor(s) and visor assembly on a scale from 1 to 5:

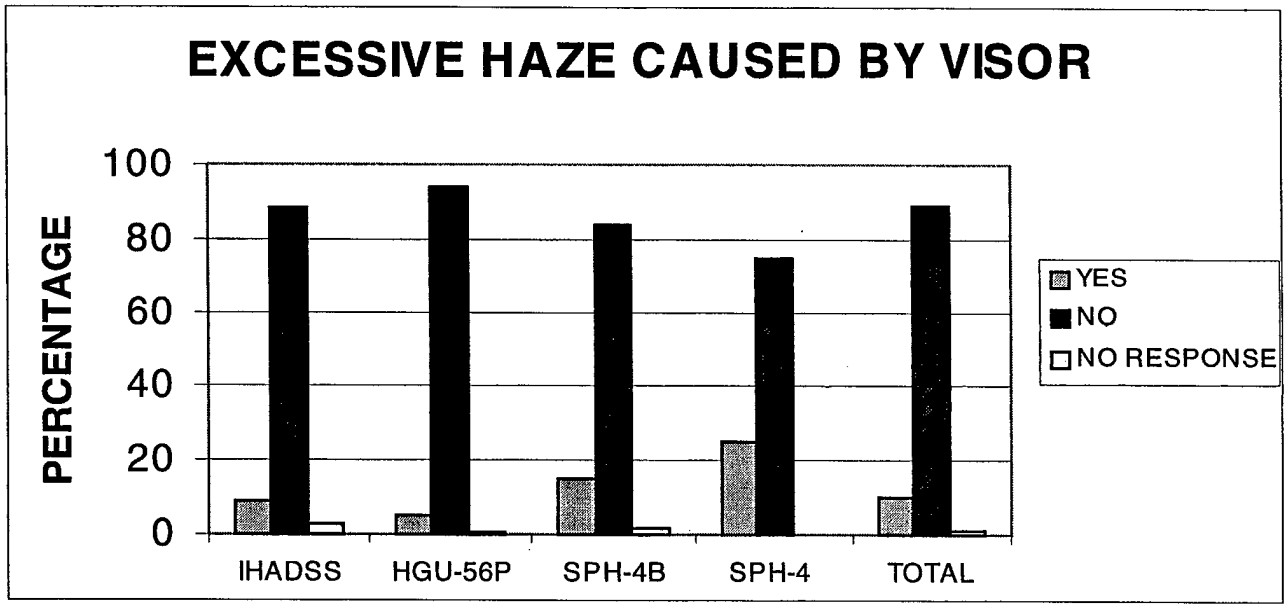
	IHADSS (n=34)	HGU-56P (n=131)	SPH-4B (n=74)	SPH-4 (n=16)	Total (n=255)
Very poor	2.9%	0.76%	2.7%	12.5%	2.3%
Poor	0%	3.1%	1.4%	0%	2.0%
Borderline	32.4%	14.5%	13.5%	12.5%	16.5%
Good	55.9%	57.3%	56.8%	56.3%	56.9%
Very good	8.9%	22.1%	24.3%	12.5%	20.4%
No response	0%	2.3%	1.4%	6.3%	2.0%



III. OPTICAL QUALITY

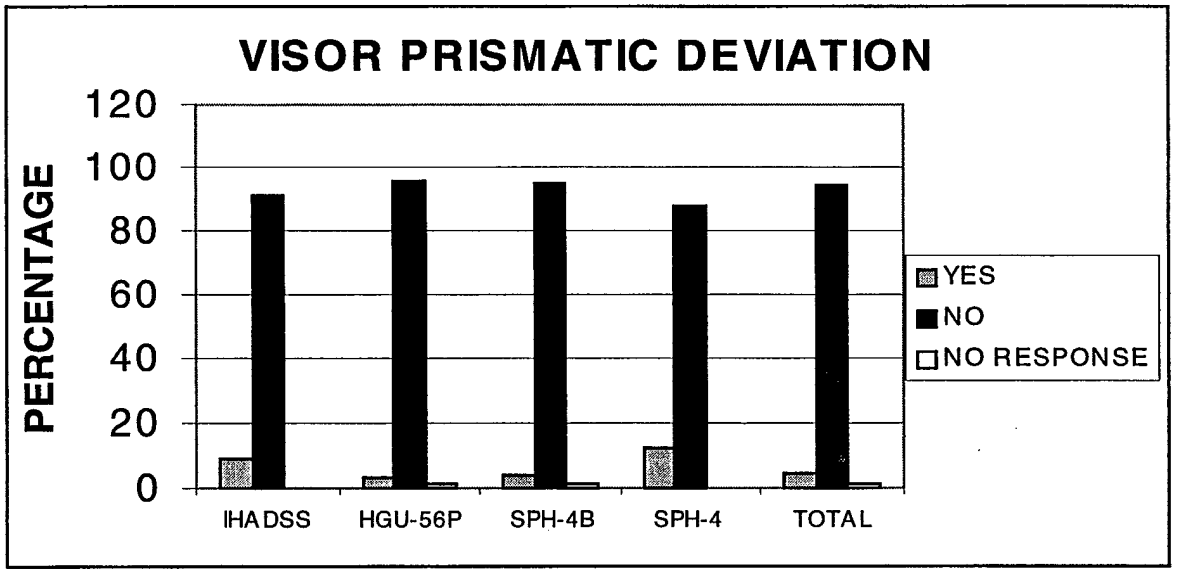
a. Do you experience problems with excessive haze (light scatter) caused by your visor?

	IHADSS (n=34)	HGU-56P (n=131)	SPH-4B (n=74)	SPH-4 (n=16)	Total (n=255)
Yes	8.8%	5.3%	14.9%	25.0%	9.8%
No	88.2%	93.9%	83.8%	75.0%	89.0%
No Response	2.9%	0.8%	1.4%	0%	1.2%



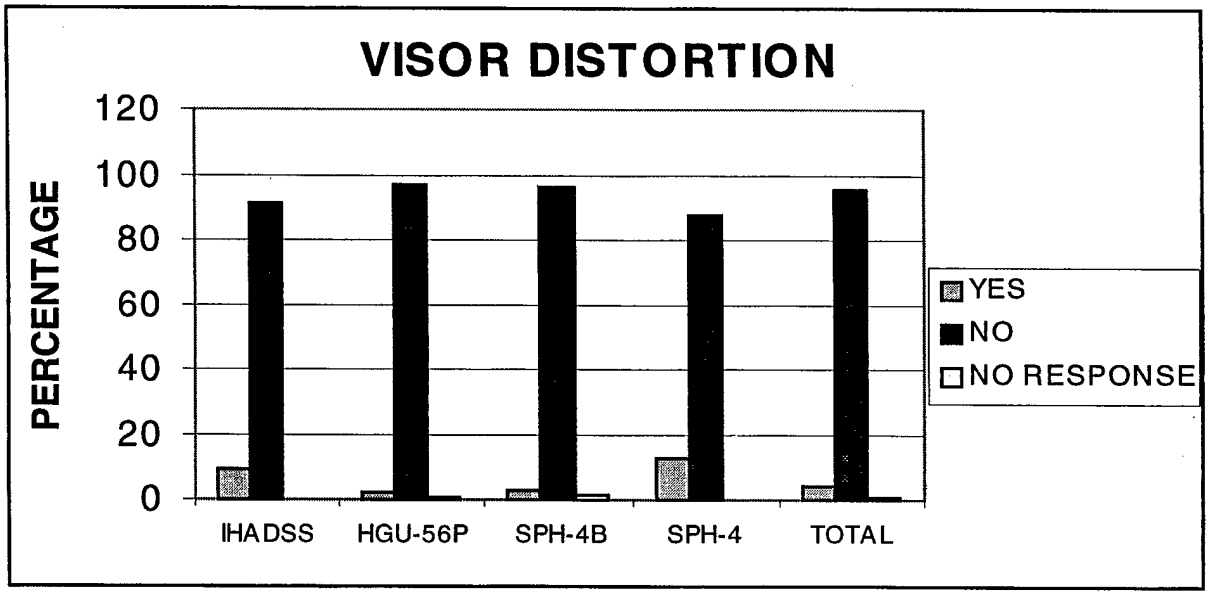
b. Do you have problems with prismatic deviation (object/image displacement) when using your visor?

	IHADSS (n=34)	HGU-56P (n=131)	SPH-4B (n=74)	SPH-4 (n=16)	Total (n=255)
Yes	8.8%	3.1%	4.1%	12.5%	4.7%
No	91.2%	95.4%	94.6%	87.5%	94.1%
No Response	0%	1.5%	1.4%	0%	1.2%



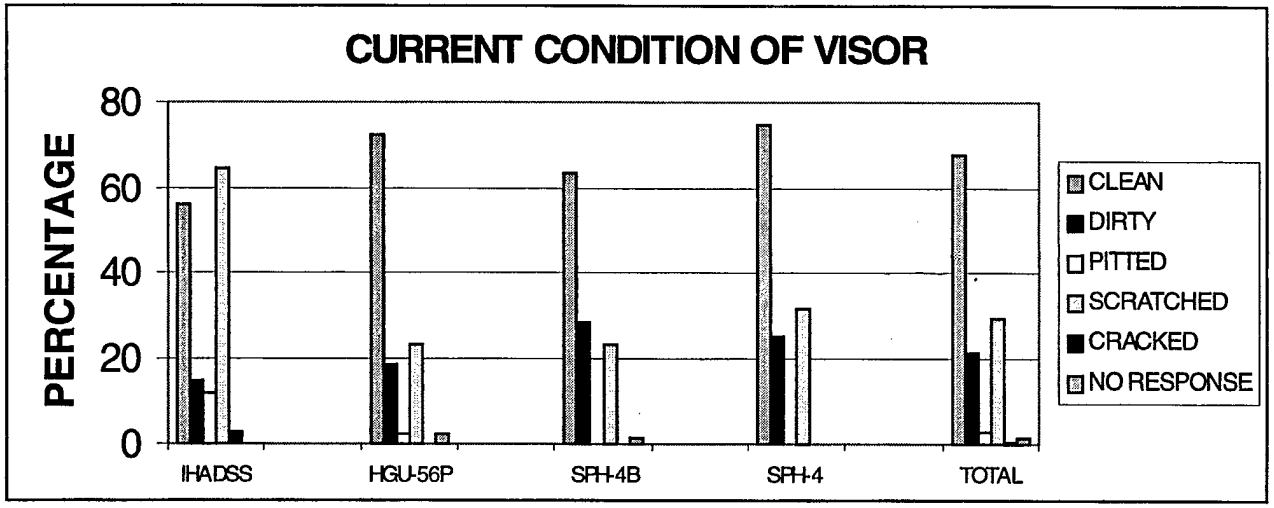
c. Do you have problems with distortion (waviness) when using your visor?

	IHADSS (n=34)	HGU-56P (n=131)	SPH-4B (n=74)	SPH-4 (n=16)	Total (n=255)
Yes	8.8%	2.3%	2.7%	12.5%	3.9%
No	91.2%	96.9%	95.9%	87.5%	95.3%
No Response	0%	0.8%	1.4%	0%	0.8%



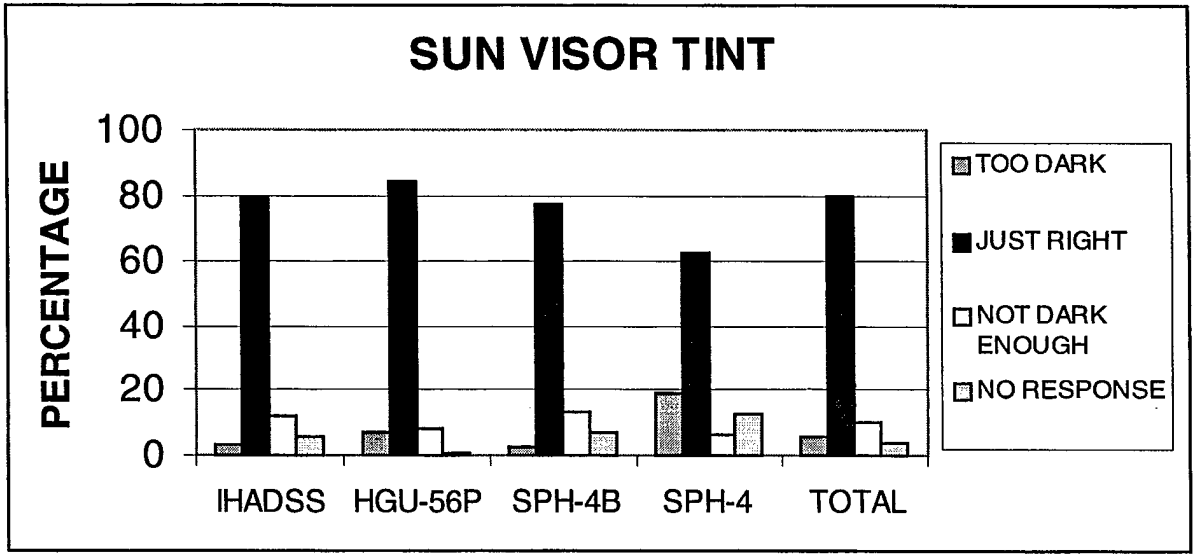
d. Circle all that describe the current condition of your visor?

	IHADSS (n=34)	HGU-56P (n=131)	SPH-4B (n=74)	SPH-4 (n=16)	Total (n=255)
Clean	55.9%	72.5%	63.5%	75.0%	67.8%
Dirty	14.7%	18.3%	28.4%	25.0%	21.2%
Pitted	11.8%	2.3%	0%	0%	2.8%
Scratched	64.7%	22.9%	23.0%	31.3%	29.0%
Cracked	2.9%	0%	0%	0%	0.4%
No response	0%	2.3%	1.4%	0%	1.6%



e. Is the tint on your tinted sun visor:

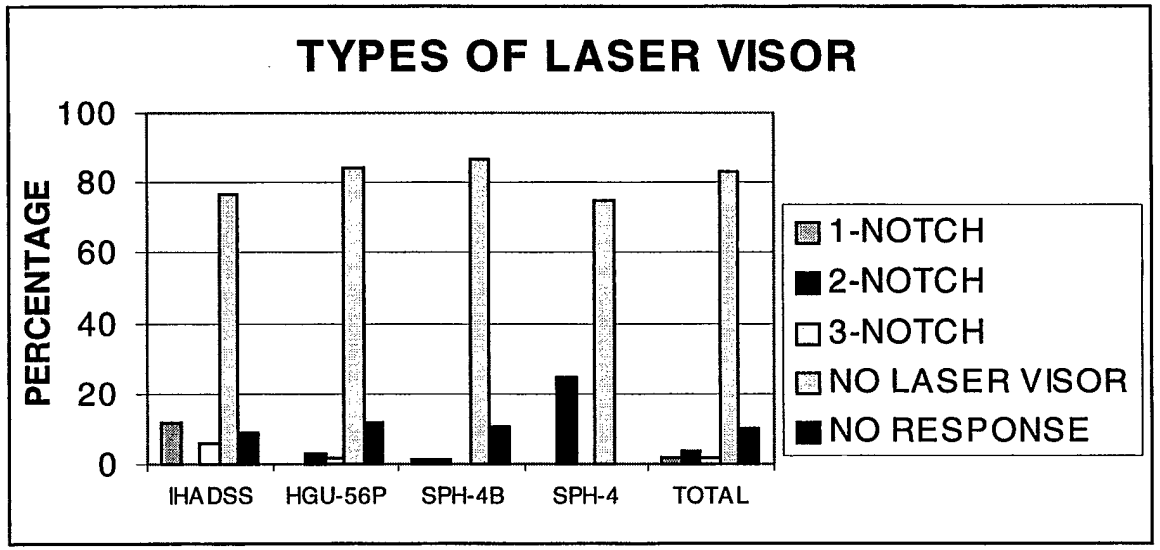
	IHADSS (n=34)	HGU-56P (n=131)	SPH-4B (n=74)	SPH-4 (n=16)	Total (n=255)
Too dark	2.9%	6.9%	2.7%	18.8%	5.9%
Just right	79.4%	84.0%	77.0%	62.5%	80.0%
Not dark enough	11.8%	8.4%	13.5%	6.3%	10.2%
No Response	5.9%	0.8%	6.8%	12.5%	4.0%



f. Is your laser visor:

	*IHADSS (n=34)	HGU-56P (n=131)	SPH-4B (n=74)	SPH-4 (n=16)	Total (n=255)
1-notch	11.8%	0%	1.4%	0%	2.0%
2-notch	0%	3.1%	1.4%	25.0%	3.6%
3-notch	5.8%	1.5%	0%	0%	1.5%
No laser visor	76.5%	84.0%	86.5%	75.0%	83.2%
No Response	8.8%	11.5%	10.8%	0%	10.2%

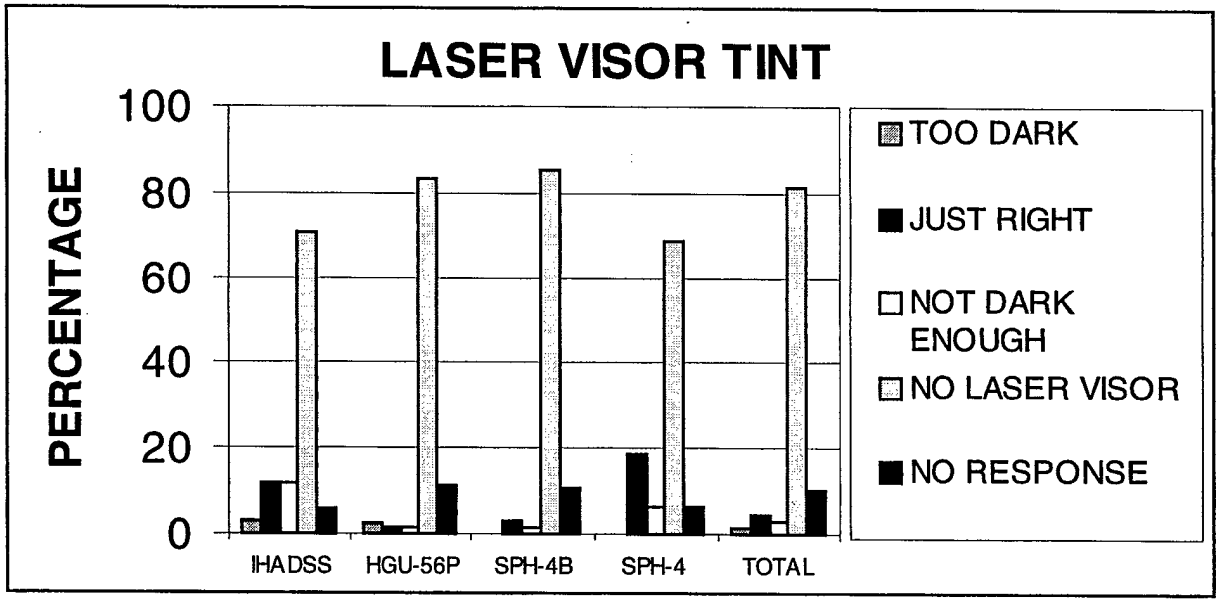
*NOTE: One respondent noted that he had a 1-notch and a 3-notch laser visor.



g. Is the tint of your laser visor:

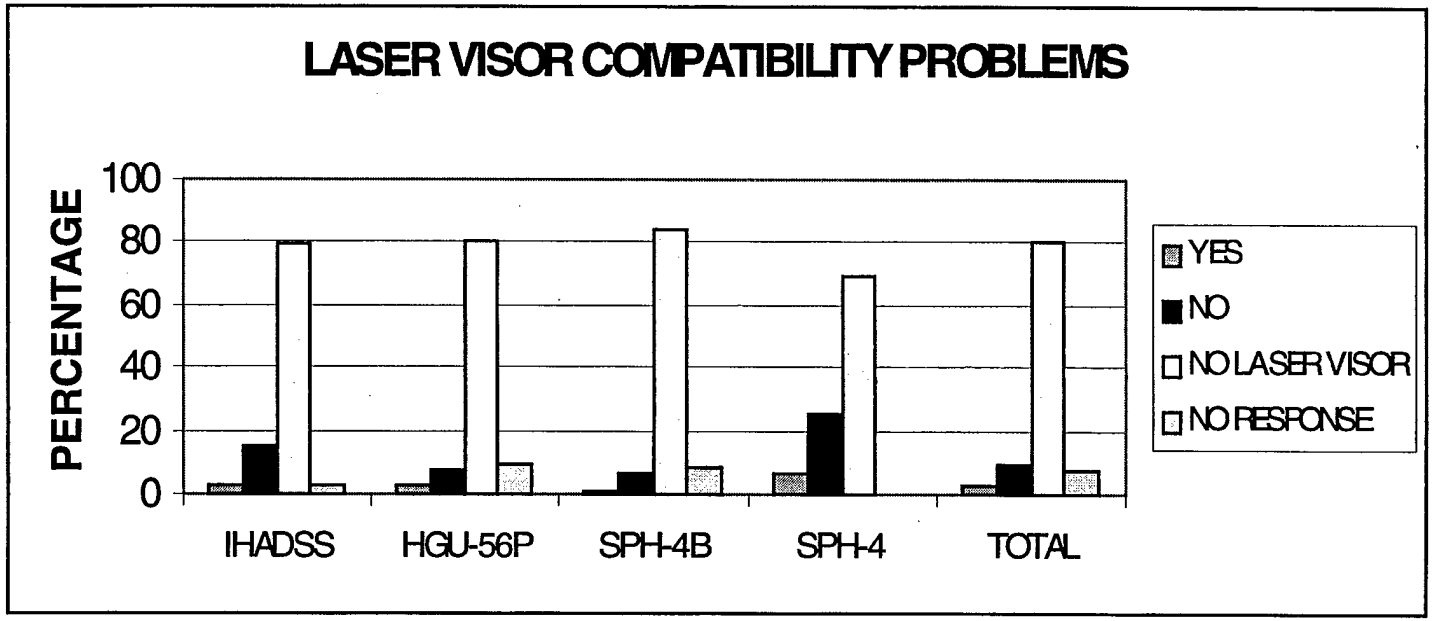
	*IHADSS (n=34)	HGU-56P (n=131)	SPH-4B (n=74)	SPH-4 (n=16)	Total (n=255)
Too dark	2.9%	2.3%	0%	0%	1.6%
Just right	11.8%	1.5%	2.7%	18.8%	4.3%
Not dark enough	11.8%	1.5%	1.4%	6.3%	3.1%
No laser visor	70.6%	83.2%	85.1%	68.8%	81.2%
No Response	5.9%	11.5%	10.8%	6.3%	10.2%

*NOTE: One respondent noted that he had a 1-notch and a 3-notch laser visor.



h. When using a laser visor, do you experience compatibility problems with cockpit displays due to the color deviation (color change)?

	IHADSS (n=34)	HGU-56P (n=131)	SPH-4B (n=74)	SPH-4 (n=16)	Total (n=255)
Yes	2.9%	3.1%	1.4%	6.3%	2.8%
No	14.7%	7.6%	6.8%	25.0%	9.4%
No laser visor	79.4%	80.2%	83.8%	68.8%	80.4%
No Response	2.9%	9.2%	8.1%	0%	7.5%



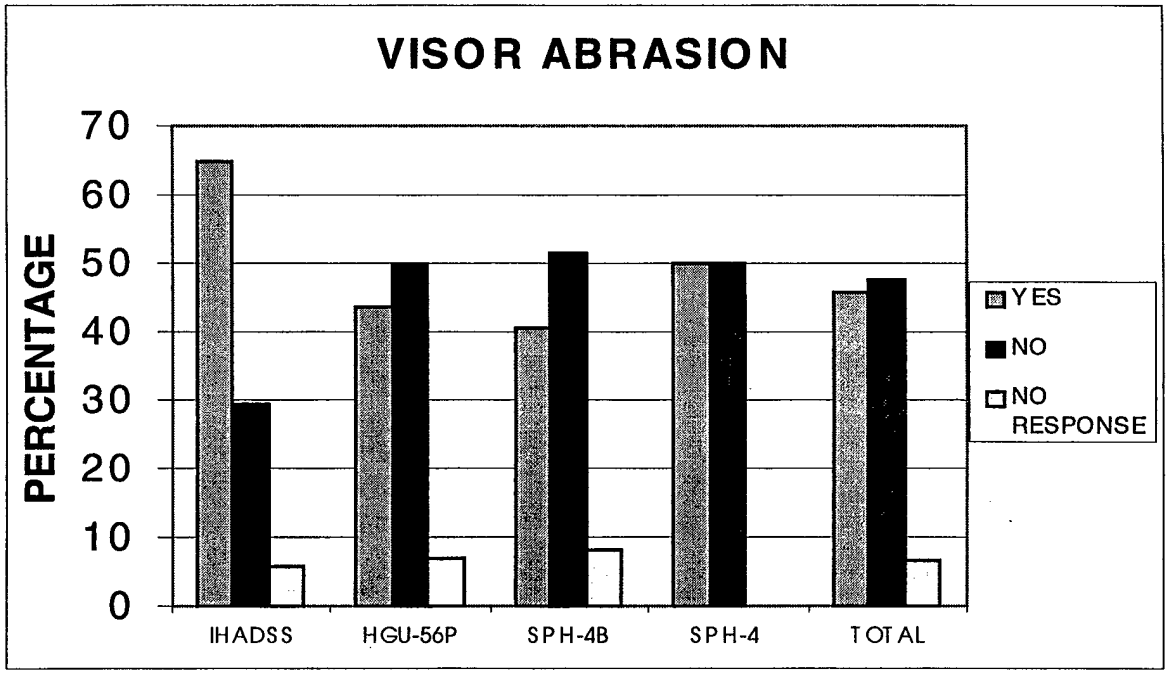
If yes, what:

Comments:	(IHADSS)	"Symbology on VDU (video display unit) is dimmed"
	(HGU-56P)	"Can't see MFD on lowlight days" "Marconi strips and digits unreadable"
	(SPH-4B)	"Red lights appear dim but readable, reddish brown in color"
	(SPH-4)	"MMS (mast-mounted site) display DGS"

IV. Maintenance

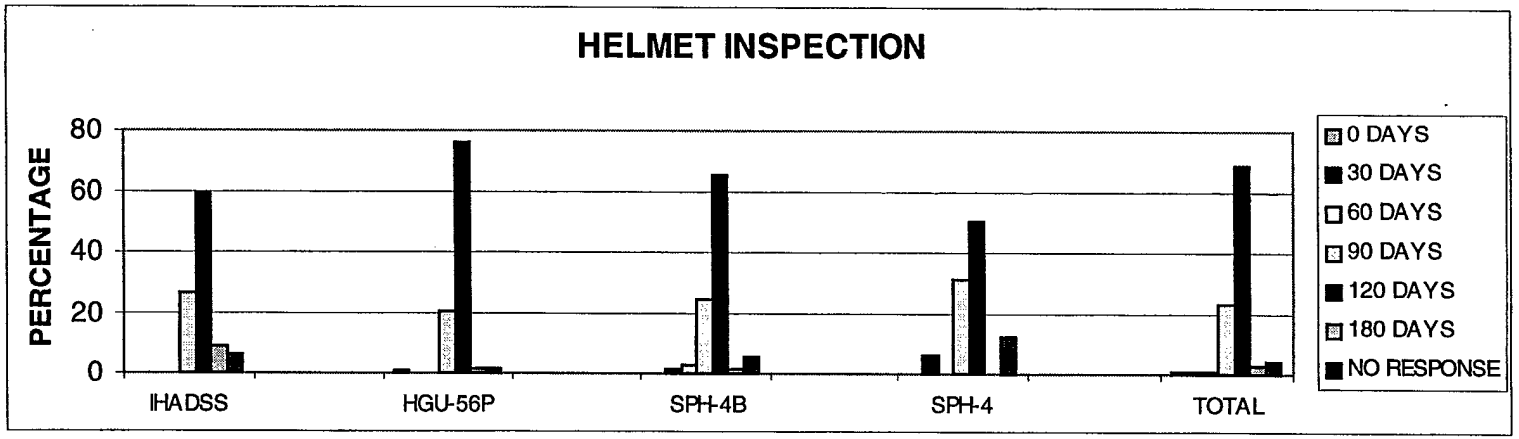
a. Is your visor easily scratched?

	IHADSS (n=34)	HGU-56P (n=131)	SPH-4B (n=74)	SPH-4 (n=16)	Total (n=255)
Yes	64.7%	43.5%	40.5%	50.0%	45.9%
No	29.4%	49.6%	51.4%	50.0%	47.5%
No Response	5.9%	6.9%	8.1%	0%	6.7%



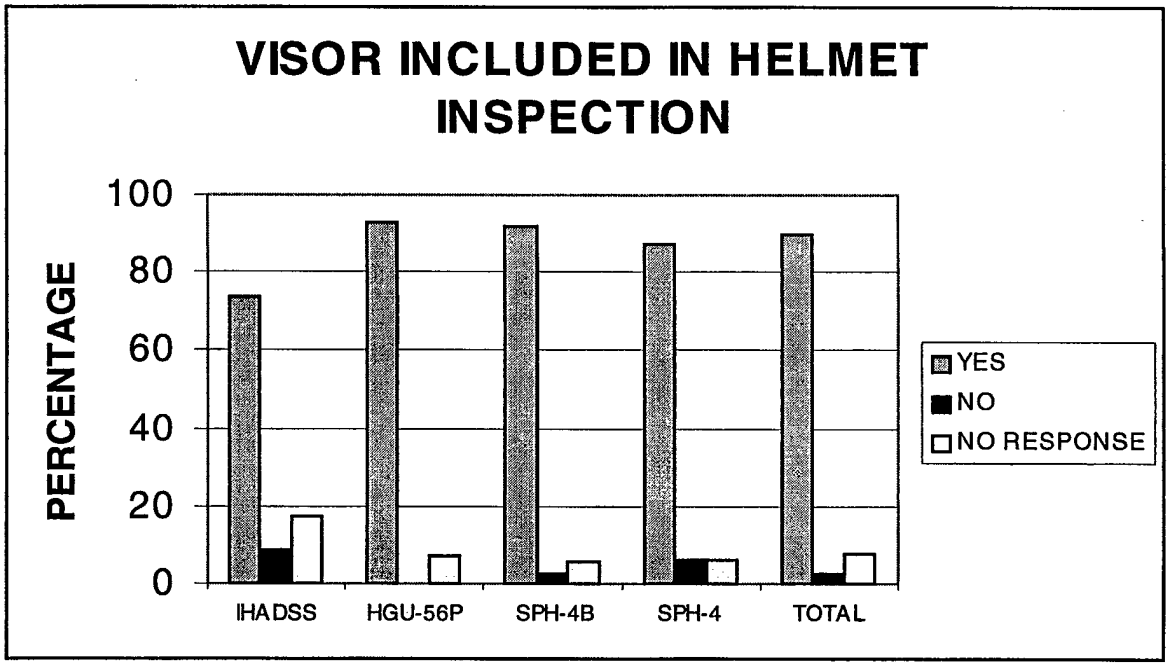
b. How often is your helmet inspected?

	IHADSS (n=34)	HGU-56P (n=131)	SPH-4B (n=74)	SPH-4 (n=16)	Total (n=255)
0 days	0%	0.8%	0%	0%	0.4%
30 days	0%	0%	1.4%	6.3%	0.8%
60 days	0%	0%	2.7%	0%	0.8%
90 days	26.5%	20.6%	24.3%	31.3%	23.1%
120 days	58.8%	75.6%	64.9%	50.0%	68.6%
180 days	8.8%	1.5%	1.4%	0%	2.4%
No response	5.9%	1.5%	5.4%	12.5%	3.9%



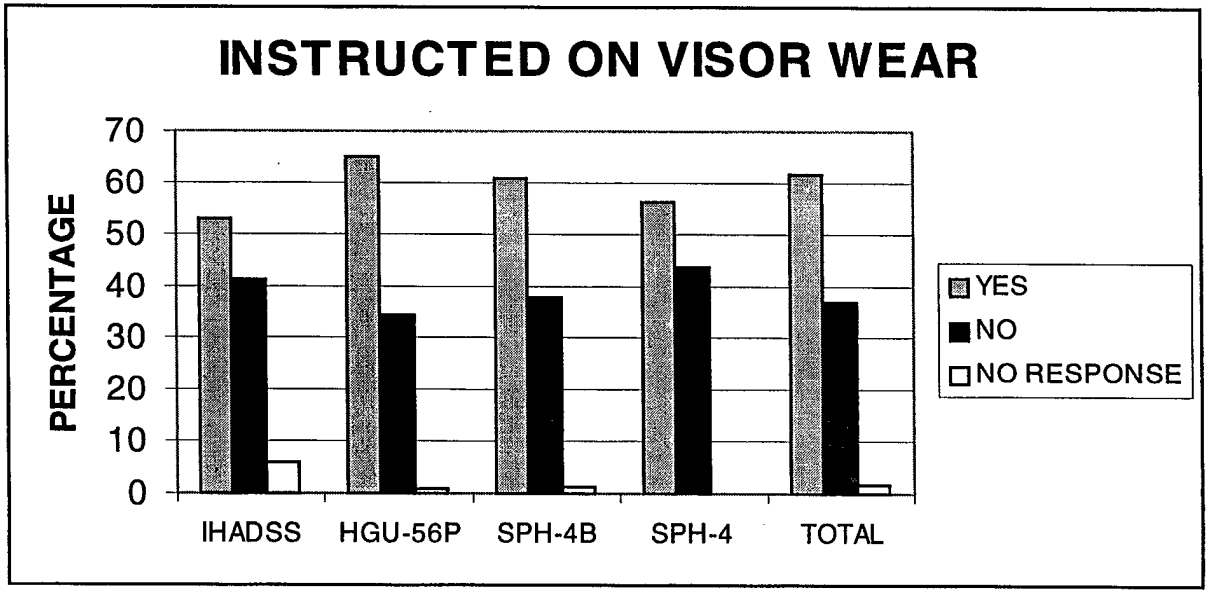
c. Is the visor included in the helmet inspection?

	IHADSS (n=34)	HGU-56P (n=131)	SPH-4B (n=74)	SPH-4 (n=16)	Total (n=255)
Yes	73.5%	93.1%	91.9%	87.5%	89.8%
No	8.8%	0%	2.7%	6.25%	2.3%
No Response	17.6%	6.9%	5.4%	6.25%	7.9%



d. Have you ever been instructed on how to properly wear your visor?

	IHADSS (n=34)	HGU-56P (n=131)	SPH-4B (n=74)	SPH-4 (n=16)	Total (n=255)
Yes	52.9%	64.9%	60.8%	56.3%	61.6%
No	41.2%	34.4%	37.8%	43.8%	36.9%
No Response	5.9%	0.8%	1.4%	0%	1.6%



d.1. If so, by whom/where?

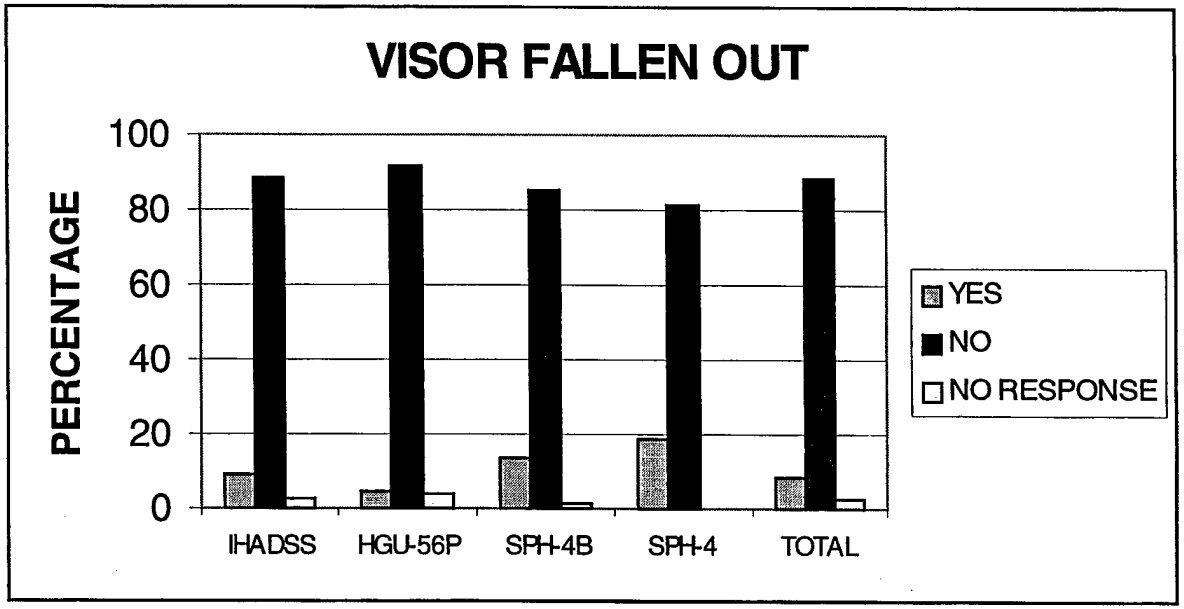
Percentages based only on YES responses

	IHADSS (n=18)	HGU-56P (n=85)	SPH-4B (n=45)	SPH-4 (n=9)	Total (n=157)
Flight school IPs	22.2%	14.1%	15.6%	33.3%	16.6%
ALSE	27.8%	63.5%	53.3%	44.4%	55.4%
ATTC	11.1%	0%	6.7%	0%	3.2%
Honeywell	11.1%	0%	0%	0%	1.3%
AQC	5.6%	0%	2.2%	0%	1.3%
CIF (when issued)	0%	5.9%	0%	0%	3.2%
Safety officer	0%	1.2%	2.2%	0%	1.3%
IERW classes	0%	0%	4.4%	11.1%	1.9%
No Response	22.2%	15.3%	15.5%	11.1%	15.9%

NOTE: The majority of respondents listed "by whom" but not "where." Of the "where" responses, Fort Rucker was most reported.

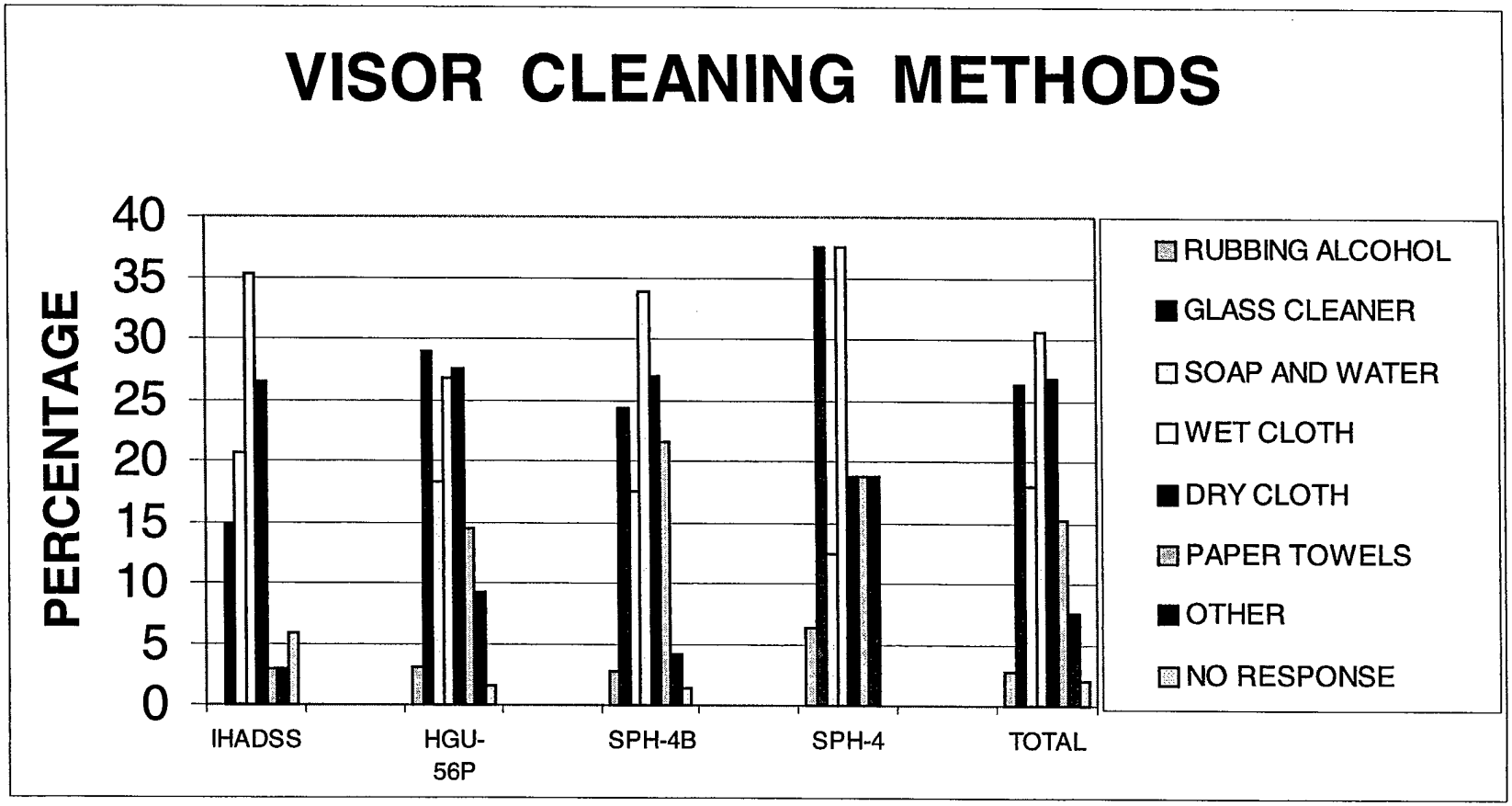
e. Has your visor ever fallen out?

	IHADSS (n=34)	HGU-56P (n=131)	SPH-4B (n=74)	SPH-4 (n=16)	Total (n=255)
Yes	8.8%	4.6%	13.5%	18.8%	8.6%
No	88.2%	91.6%	85.1%	81.3%	88.6%
No Response	2.9%	3.8%	1.4%	0%	2.7%



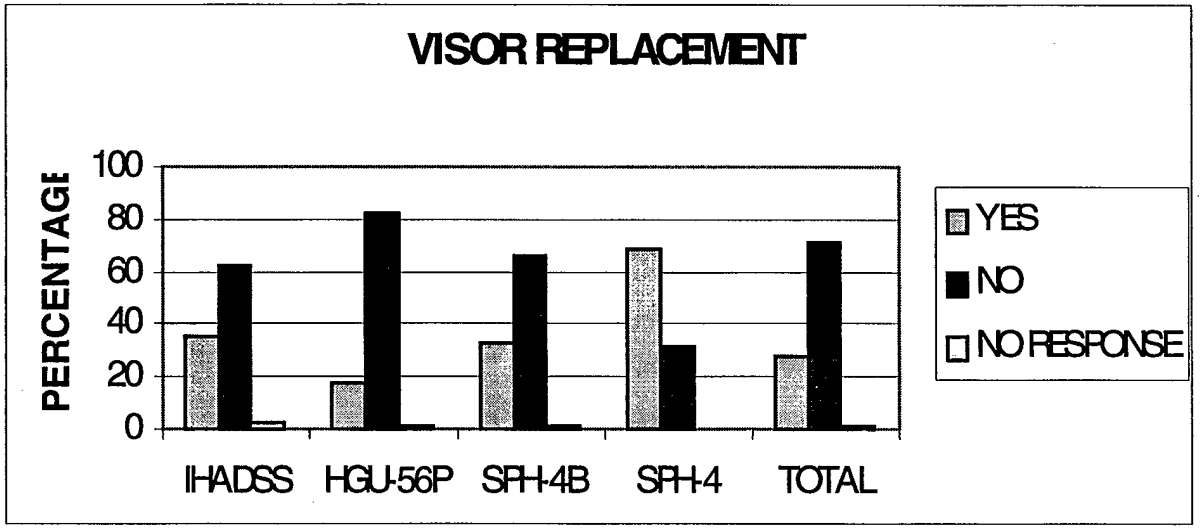
f. Circle the method you use for cleaning your visor:
Percentages exceed 100% because many respondents used several methods for cleaning their visor.

	IHADSS (n=34)	HGU-56P (n=131)	SPH-4B (n=74)	SPH-4 (n=16)	Total (n=255)
Rubbing alcohol	0%	3.1%	2.7%	6.3%	2.8%
Glass cleaner	14.7%	29.0%	24.3%	37.5%	26.3%
Soap and water	20.6%	18.3%	17.6%	12.5%	18.0%
Wet cloth	35.3%	26.7%	33.8%	37.5%	30.6%
Dry cloth	26.5%	27.5%	27.0%	18.8%	26.7%
Paper towels	2.9%	14.5%	21.6%	18.8%	15.3%
Other	2.9%	9.2%	4.1%	18.8%	7.5%
No Response	5.9%	1.5%	1.4%	0%	2.0%


VISOR CLEANING METHODS
PERCENTAGE
40
35
30
25
20
15
10
5
0
IHADSS
HGU-56P
SPH-4B
SPH-4
TOTAL
RUBBING ALCOHOL
GLASS CLEANER
SOAP AND WATER
WET CLOTH
DRY CLOTH
PAPER TOWELS
OTHER
NO RESPONSE

g. Has your visor ever been replaced?

	IHADSS (n=34)	HGU-56P (n=131)	SPH-4B (n=74)	SPH-4 (n=16)	Total (n=255)
Yes	35.3%	17.6%	32.4%	68.8%	27.5%
No	61.8%	81.7%	66.2%	31.3%	71.4%
No Response	2.9%	0.8%	1.4%	0%	1.2%

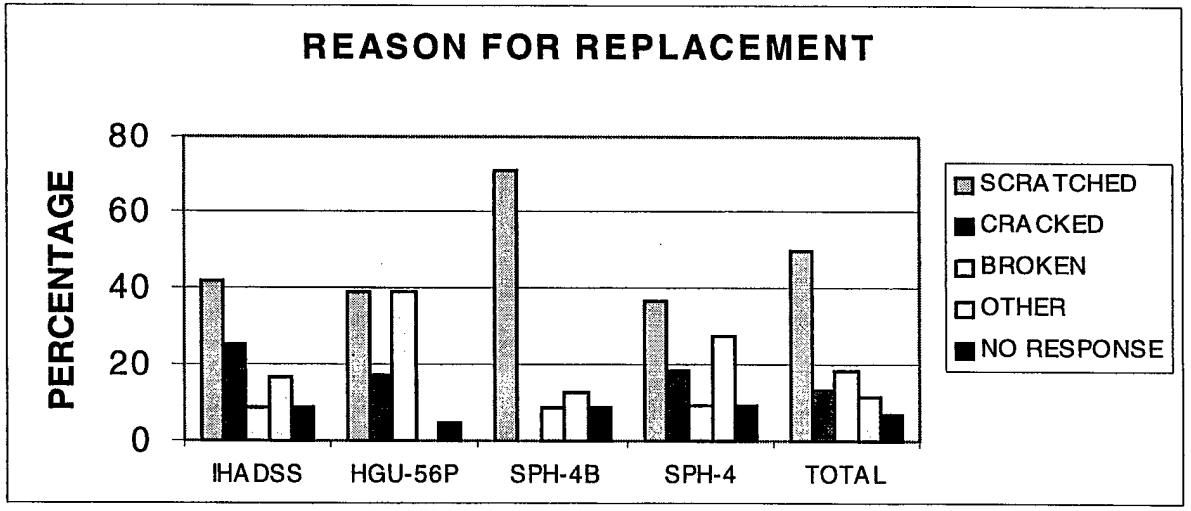


g.1. If yes, for what reason?

Percentages based only on YES responses

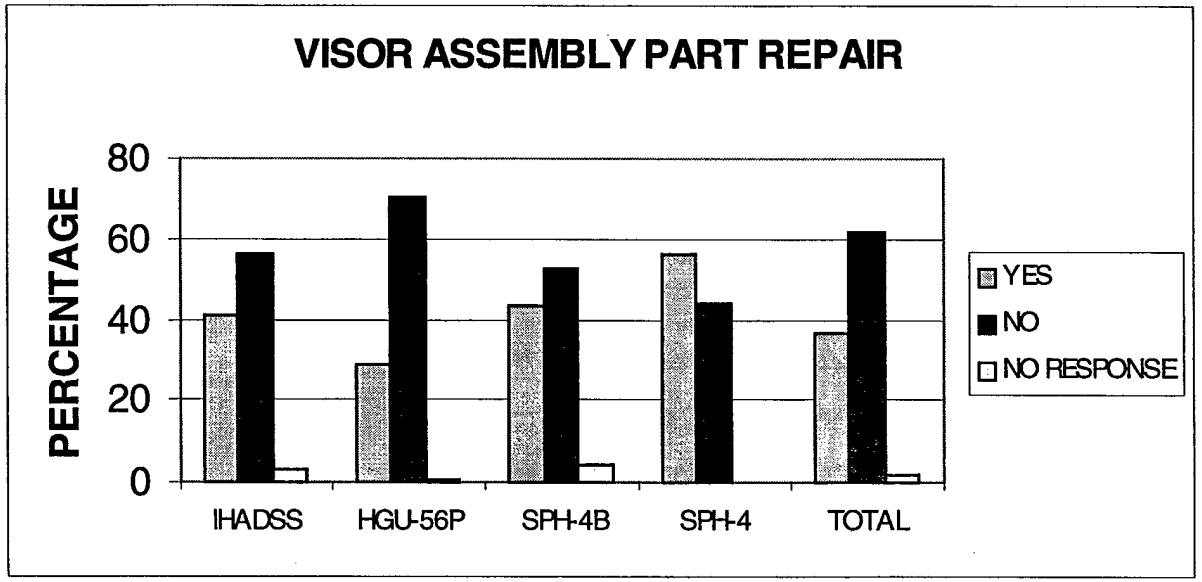
	IHADSS (n=12)	HGU-56P (n=23)	SPH-4B (n=24)	SPH-4 (n=11)	Total (n=70)
Scratched	41.7%	39.1%	70.8%	36.4%	50.0%
Cracked	25.0%	17.4%	0%	18.2%	12.9%
Broken	8.3%	39.1%	8.3%	9.1%	18.5%
*Other	16.7%	0%	12.5%	27.3%	11.4%
No Response	8.3%	4.3%	8.3%	9.1%	7.1%

NOTE: *Other denotes that the pilot was unsure of the problem but, was advised to replace the visor.



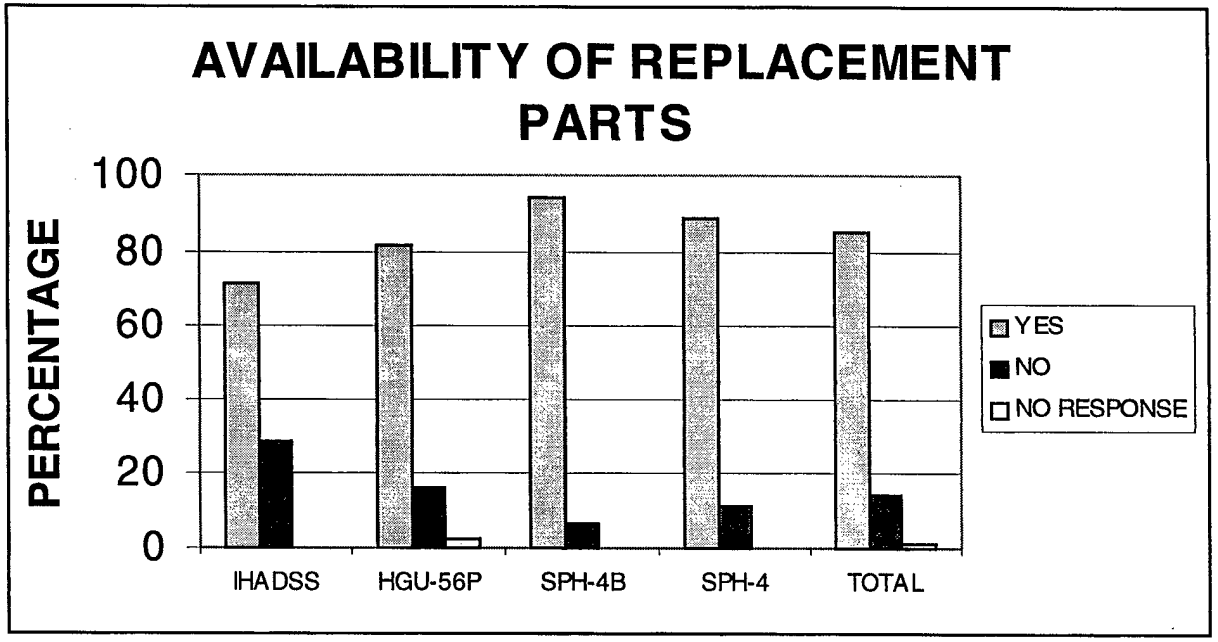
h. Have you ever had to repair part of the visor assembly on your helmet?

	IHADSS (n=34)	HGU-56P (n=131)	SPH-4B (n=74)	SPH-4 (n=16)	Total (n=255)
Yes	41.2%	29.0%	43.2%	56.3%	36.5%
No	55.9%	70.2%	52.7%	43.8%	61.6%
No Response	2.9%	0.8%	4.1%	0%	2.0%



h.1. If yes, were replacement parts readily available?
Percentages based only on YES responses.

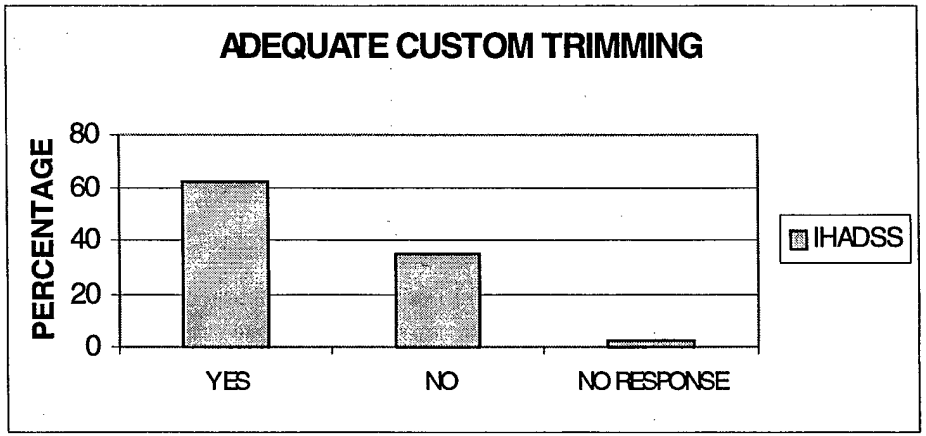
	IHADSS (n=14)	HGU-56P (n=38)	SPH-4B (n=32)	SPH-4 (n=9)	Total (n=93)
Yes	71.4%	81.6%	93.8%	88.9%	85.0%
No	28.6%	15.8%	6.3%	11.1%	14.0%
No Response	0%	2.6%	0%	0%	1.1%



V. FOR IHADSS USERS ONLY

a. Was the custom trimming of the visor accurate and adequate?

	IHADSS (n=34)
Yes	61.8%
No	35.3%
No Response	2.9%

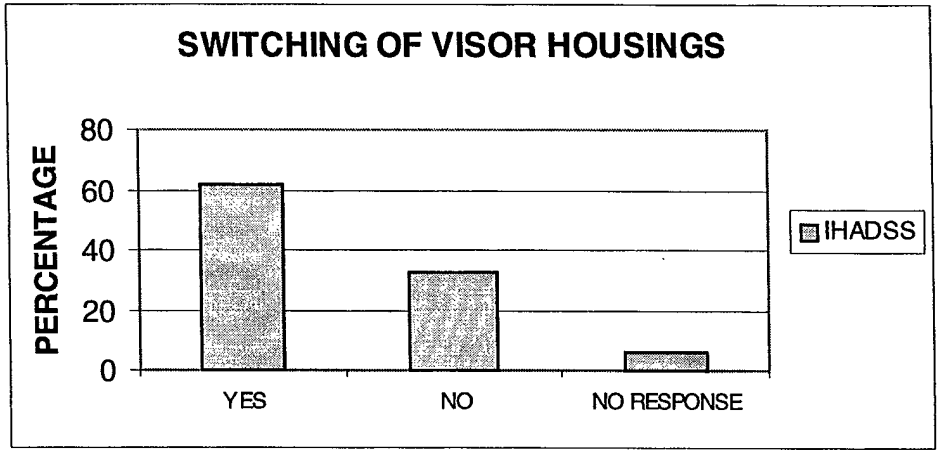


Remarks:

"With the requirement of turning in our helmets at PCS (permanent change of station), there are a large number of trimmed visors available at the unit when we in-process. High cost of visors force us to 'shop around' until we find a pre- trimmed visor that is a close fit. The answer - possibly we turn in helmets but take visors with us from unit to unit"
"Needs to be redone several times"
"Needs to be a standard way of cutting them or even manufacturing them that way"
"Hits the HDU"
"At first I could not lower my visor to the lock position while wearing the HMD (helmet-mounted display)"
"We turn in the visors and they are re-issued - one cut does not fit all"
"The visor is not trimmed on the ANVIS visor"

b. Do you switch visor housings?

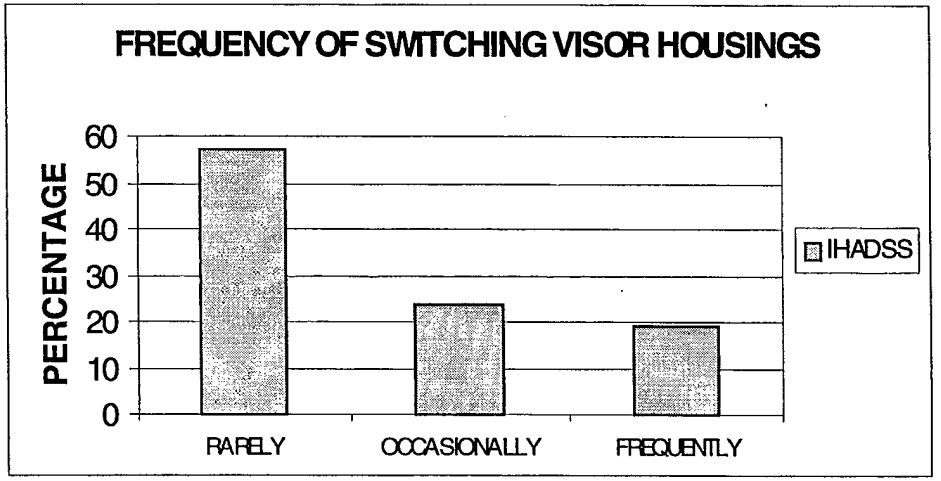
	IHADSS (n=34)
Yes	61.8%
No	32.3%
No Response	5.9%



c. If yes, how often:

Percentages based only on YES responses.

	IHADSS
Rarely	57.1%
Occasionally	23.8%
Frequently	19.1%



Please comment on any other problems regarding your visor and visor assembly (no matter how general or specific in nature) not previously addressed:

Comments: "Conform IHADSS helmet visors for NVG mounting"
"Hard to get visor cut properly with IHADSS"
"The IHADSS needs a dual visor assembly"
"Whenever moving from back to front seat and NVG to IHADSS visor"